BELL TELEPHONE QUARTERLY

VOL. XIII OCTOBER, 1934

THE TELEPHONE PROBLEM IN THE WORLD'S LARGEST METROPOLITAN AREA

BUYING BY TELEPHONE AT DEPARTMENT STORES

TELEPHONE POWER PLANTS

THE INTERNATIONAL TELEPHONE CONFERENCES OF 1934

SIGNIFICANT CHANGES IN THE OCCUPATIONAL DISTRIBUTION OF THE AMERICAN POPULATION

AMERICAN TELEPHONE & TELEGRAPH CO. • NEW YORK

BELL TELEPHONE QUARTERLY

A Medium of Suggestion and a Record of Progress

CONTENTS FOR OCTOBER 1934

PAGE

The Telephone Problem in the World's Largest Metropolitan Area —*Kirtland A. Wilson* 233

Buying by Telephone at Department Stores—*John M. Shaw* 267

Telephone Power Plants—*G. L. Weller* 289

The International Telephone Conferences of 1934 —*H. E. Shreeve and H. S. Osborne* 303

Significant Changes in the Occupational Distribution of the American Population—*R. L. Tomblen* 309

Notes on Recent Occurrences 327

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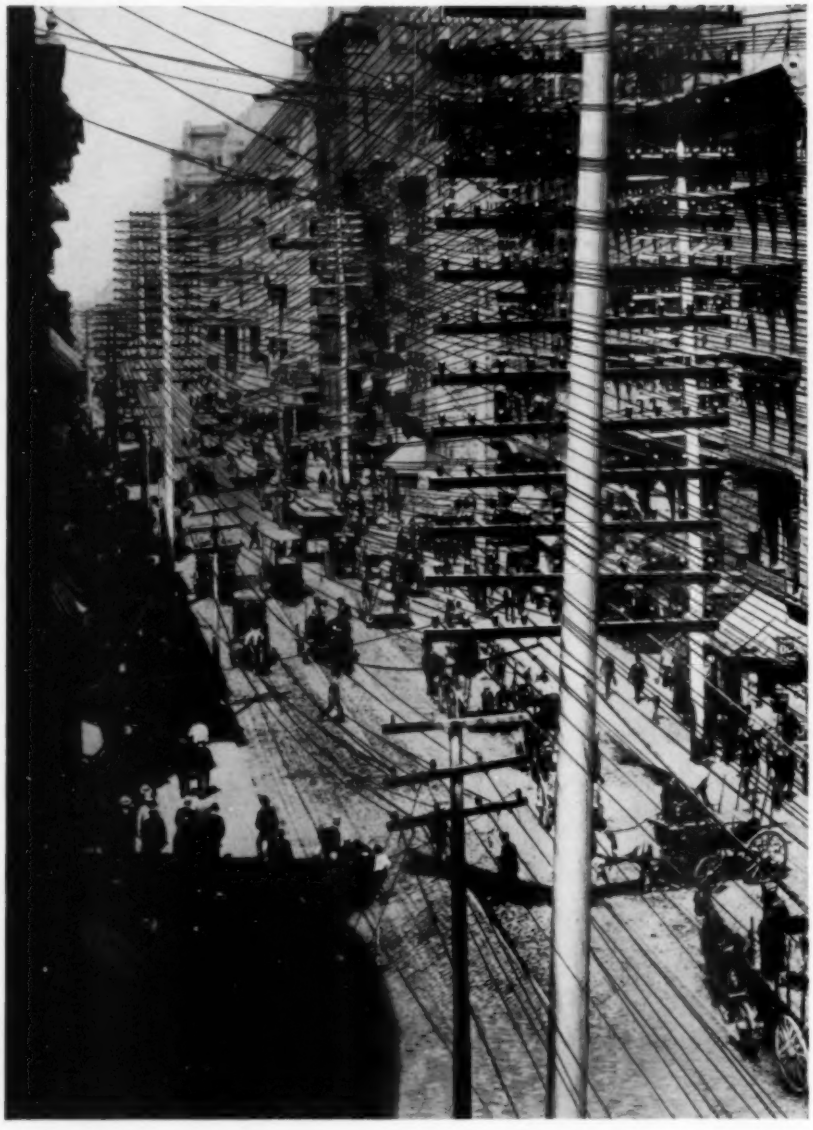


Lower Broadway, New York City, in the '80s, Before Engineers Had Successfully Developed the Art of Placing Telephone Wires in Cables and Beneath the Surface. Some Poles Along Other Highways Were Ninety Feet High and Carried as Many as Fifty Cross Arms.

The Telephone Problem in the World's Largest Metropolitan Area

A Summary of Past and Present

MORE than a sixth of all the telephones in the nation-wide Bell System are concentrated in a section which composes only about 1/1200th of the land area of the continental United States.

This section, as defined by the United States Census Bureau, is the "New York-Northeastern New Jersey Metropolitan District," generally called the New York Metropolitan Area. It includes large sections of those two states and a small part of southwestern Connecticut, comprising a total of 2,514 square miles, a territory twice the size of Rhode Island. An exact circle enclosing such an area would have a diameter of about 57 miles. In its actual form, and using the Borough of Manhattan, New York City, as the center, the longest axis is approximately 95 miles and the shortest 40 miles.

Within this Area are approximately 300 incorporated communities. Among them, in addition to New York City with its five boroughs and population of 7,000,000, are Newark with about 450,000, Jersey City with more than 300,000, three other cities with well over 100,000, eight with over 50,000, fifteen with over 25,000, and more than a score with over 10,000.

The Area's aggregate resident population—10,901,424 according to the 1930 Census—exceeds that of any state except New York. Computed on the basis of that census, it contributes nearly an eleventh of the population of the entire United States.

This is the largest metropolitan territory on the globe: largest in geographical extent, in resident and working population, and in variety and volume of financial, industrial and com-

mercial activities. It is a unit in a thousand and one matters of daily importance, not merely because of the relationships of each community with its nearest neighbors but chiefly because the ways in which people live and work within this Area are directly affected by the presence of the metropolis.

The commuting area, for example, coincides in large measure with the Metropolitan Area and in some sections extends beyond it. Many thousands travel regularly into New York City from points even thirty to forty miles away. Commuter traffic, entering and leaving the city by railroads and ferries, totaled over 268,000,000 in 1932. Including transient visitors and persons from the upper part of Manhattan, the number entering—by all forms of passenger transportation—the borough's chief business and financial sections south of 59th Street is estimated at around 2,800,000 each business day.

The retail trading area of New York City is even larger than the Metropolitan District as defined by the Census Bureau. So also is the New York Region as defined by the Regional Plan Association, a group of representative citizens who seek to help direct intelligent planning for the needs of the increasing population.

Within the Area is the Port of New York, whose waterways and 700 miles of waterfront not only produce a vast volume of ocean and river traffic but greatly complicate engineering problems in all phases of communication. The radial lines of eleven railroad companies and of numerous rapid transit systems reach into the central cluster of population from nearly every direction of the compass.

Manhattan, the heart of the Area, is a narrow island, twelve and one half miles long and only two and one half miles at its widest. In its narrow southern end, below Fulton Street, in a district of 245 acres, with 218 acres of building area, are concentrated, among many varieties of activity, the mechanism and personnel through which a large part of the world's financial and exchange trading activities clear. Thirty per cent of

the borough's buildings above thirty-two stories in height are in this district, some ranging over forty, fifty or sixty stories in height.

Still another borough of the city, Richmond, is an island, as its popular name, Staten Island, indicates. Long Island, with two other city boroughs—one of them (Kings, or Brooklyn) the most populous of the five—and with a large suburban population, stretches 125 miles eastward from New York Harbor, separated from the mainland by a waterway narrow enough for bridges and tunnels only at its city end. Separating New York and New Jersey and also the suburban sections north of New York City is the Hudson River.

Nearly one-third of the people of the Metropolitan District are foreign-born, and about two-fifths are of foreign or mixed parentage. Together they compose over two-thirds of the Area's residents. Practically all races are represented, some of the groups being larger than the populations of the biggest cities in their lands of origin. There are sections where English is heard much less than some foreign vernacular.

These are among the many special characteristics of the Area which suggest the number and magnitude of the problems involved in serving its telephone needs. How has the telephone system for meeting these needs developed, and what are its general features and methods today?

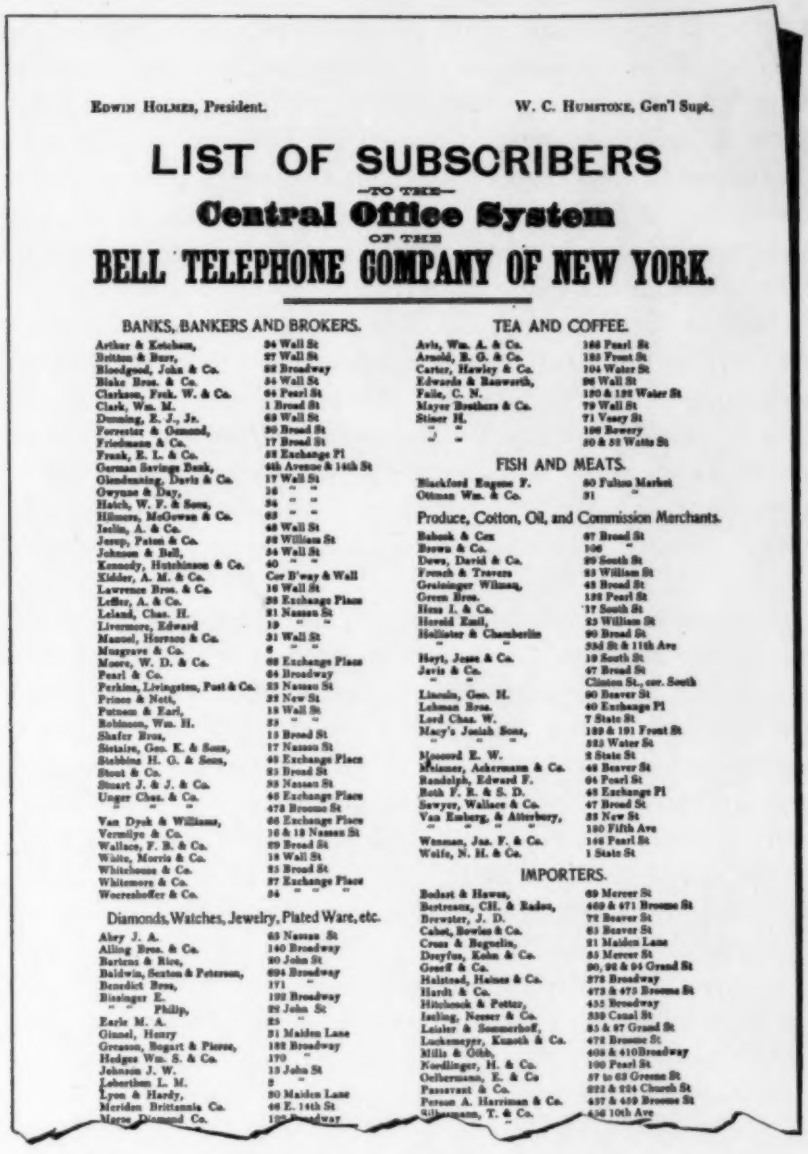
Some High Points of Metropolitan Telephone History

When the telephone was "born," New York City, which was then confined as a municipality to Manhattan Island, had over a million inhabitants. In the metropolitan environs were almost twice as many more. In the next decade the Area's population was to increase by close to a million, and by more than that total in each of the succeeding four decades. Almost frantic efforts were being made to increase the means of physical transit. The Brooklyn Bridge, first of the great over-

water highways here, was under construction. The city was having its first experiences with elevated steam railways. The demand for direct, personal communication was showing itself. Already, in 1874, a company had been formed to enable lawyers in Manhattan to telegraph to each other and to the courts.

On May 11, 1877, Alexander Graham Bell gave New York City its first telephone demonstration. Two lines of telegraph wire were borrowed for the occasion, one to Brooklyn and one to New Brunswick, N. J. A few months later, two business men of the city formed the Telephone Company of New York. Soon overwhelmed with difficulties, they were glad to sell out within a year to a group of which Theodore N. Vail, later to be head of the American Telephone and Telegraph Company, was a member. Mr. Vail and his associates organized the Bell Telephone Company of New York to operate in the area within thirty-three miles of the New York City Hall, together with outer Long Island and Monmouth County, New Jersey, the latter being the most southerly county in the territory. The 33-mile boundary, while determined on no particularly scientific basis, recognized the principle that the city and a wide region surrounding it were potentially a unit, and that any adequate telephone development must ultimately deal with the area as a whole.

After a settlement by which the integrity of the Bell patents was recognized by opposition interests operating in the city, the latters' plant and business were purchased by the Bell group, who reorganized in 1880 as the Metropolitan Telephone and Telegraph Company. A sub-licensee company, the Metropolitan District Telephone Company, was formed to handle territory adjacent to the city, and in a few years was operating through new or existing companies in several important sections and local points. Among these was Newark, which in 1878 had become the sixth city in the world to have telephone service.



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Leister & Sommerhoff, 85 & 87 Grand St
Luckemeyer, Kunoth & Co. 472 Broome St
Mills & Otth, 408 & 410 Broadway
Nordlinger, H. & Co. 100 Pearl St
Oelbermann, E. & Co 57 to 63 Greene St
Passavant & Co. 222 & 224 Church St
Person A. Harriman & Co. 457 & 459 Broome St
Silbermann, T. & Co. 436 10th Ave
" "

THE FIRST TELEPHONE DIRECTORY IN NEW YORK CITY, ISSUED IN THE SUMMER OF 1878 WITH 271 LISTINGS. TELEPHONE NUMBERS WERE NOT YET USED; CALLS WERE MADE BY GIVING THE NAME OF THE SUBSCRIBER TO THE OPERATOR.

This occupation of neighboring localities as well as New York City itself was exceedingly important in relation to subsequent events. From the beginning it was realized by those connected with the Bell enterprises that the nature of the service necessitated a unified system. Competition between two or more companies in any single center or homogeneous area would be costly to the public as well as to telephone enterprises, and would produce confusion of service, as was later proved at numerous points in this country.

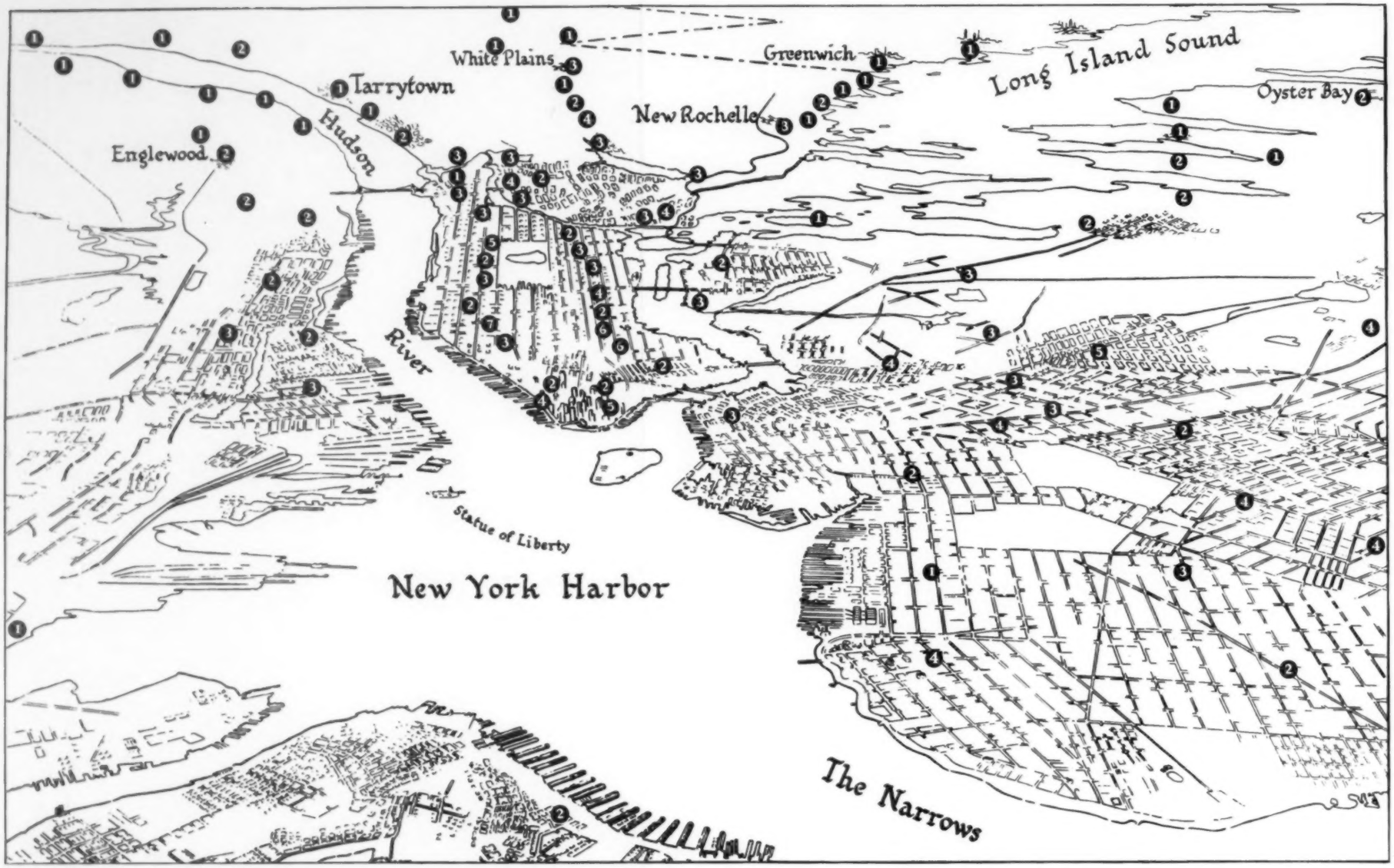
In 1883 the New York and New Jersey Telephone Company was formed to operate in the counties of Northern New Jersey and Long Island. Its head, Charles F. Cutler, followed Mr. Vail as president of the Metropolitan company and later continued as the head of its successor, the New York Telephone Company. The latter, formed in 1896, also took over ultimately other properties in the Area and generally throughout the State of New York.

The continued growth in the populations and business activities in the metropolitan sectors of both New York and New Jersey, and the telephone development which both accompanied and helped to foster this growth, led in 1927 to a return to separate corporate leadership in each. The telephone property in Northern New Jersey was purchased by the Delaware and Atlantic Telegraph and Telephone Company, which operated in the southern part of the State, and the name of this corporation was changed to the New Jersey Bell Telephone Company. This step accorded with the desirability of a single company responsible for the service in each state and under the regulation of its respective state public service body, but operating—so far as service for the public of both states was concerned—as one system. As a further means of assuring close attention to the needs of localities, the territory served by the New York company is divided for administrative purposes into four areas, three of these—Manhattan, Long Island, and Bronx-Westchester—forming the metropolitan portion of

OFFICIAL PHOTOGRAPH BY U. S. ARMY AIR CORPS

ONE OF THE MOST RECENT ACHIEVEMENTS IN THE FIELD OF AERIAL PHOTOGRAPHY

Parts of New York City and Metropolitan New Jersey and their environs. This photograph, showing America's largest city, greatest population center, foremost port, and most complex telephone service area, was taken by Capt. Albert W. Stevens at an altitude of 26,000 feet from an Army airplane piloted by Lieut. C. D. McAllister, and represents an achievement by the Army Air Corps in the development of aerial infra-red photography. It was originally published as a supplement to the National Geographic Magazine, and is reproduced here by permission of the Information Division of the Army Air Corps.



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CENTRAL OFFICES IN PART OF NEW YORK CITY AND VICINITY

The black dots on this map, which follows in outline the aerial photograph on the reverse of this page, represent the 92 locations of central offices or groups of offices serving that part of the New York-New Jersey Metropolitan Area shown in the photograph. The numeral on each dot indicates the number of central office designations under which the telephones served from each point are grouped. The total of such designations shown here is 225. In the general metropolitan service area as a whole there are 378 central offices, serving approximately 2,255,000 telephones, under 478 designations

this company's territory. Each such area is thus served by what is practically a complete local organization.

The nation-wide development of Bell facilities and connections with the thousands of companies not in the associated Bell group and with systems in foreign lands has, of course, brought to every telephone user in the New York-New Jersey Metropolitan District the convenience of universal service.

Some Early Problems and Achievements

Throughout its early years the telephone business in New York City and vicinity was confronted by an increasing variety of almost overwhelming problems. Questions of financing and other difficulties intensified those problems which were directly related to the task of serving an increasing public demand: the problems of plant engineering, construction and improvement. In the late 'eighties, development was at an acute stage and scientific progress in outside plant construction, for example, was rapid. The older types of construction had become inadequate. The situation is vividly illustrated by the disastrous effects of the great blizzard of March, 1888, when the towering poles and heavy festoons of lines in the populous sections came down in a tremendous tangle.

For some time, the engineers of the major Bell companies and others had been actively working on the difficult problem of developing an efficient cable that could be used either overhead or underground. As early as 1879, four years before the opening of the Brooklyn Bridge for roadway traffic, the Metropolitan company had installed small cables over this structure. Over it in 1877 had been run a single circuit, the first means of voice communication between water-separated sections of the Area. In 1880 the company had four cables, each with seven conductors, across this span. In the same year a cable similar to these was drawn between New York and New Jersey under the Hudson River. By 1888 the standard cable was capable

of accommodating fifty pairs of wires, but cost between $150 and $160 per pair-mile to install.

Shortly before the blizzard year, a more efficient and more economical method was discovered of insulating wires with paper and enclosing them in lead sheathing. It was a great step forward, for the modern telephone cable utilizes principles then evolved. But the practical application of improvements also takes time. Before the telephone people in New York, dealing with difficulties as to underground rights as well as engineering problems, could remedy the open-wire condition to any important extent, the Mayor ordered his Department of Public Works to chop down the poles. Fortunately for the telephone public as well as the company, this order was not carried out. Negotiations involving rights for building low-tension conduits were gradually cleared up, cable science continued to advance, and by 1895 practically all wires in the business sections were below ground.

Some Factors Which Fostered Growth

An inestimable factor for telephone progress in the Area was the sound financial position of the New York Telephone Company upon its formation in 1896. The Company was ready to do its full part in meeting and anticipating the Area's increasing requirements in a period of enormous business and residential development.

Another of the many factors which promoted growth was the matter of rates. Most people still looked upon the telephone as a luxury, and the rate levels that had been applied in these early days of the telephone were necessarily rather high and tended to result in a relatively slow growth. Few other than business people were subscribers. In 1893, fifteen years after the telephone had entered New York City, only about ten per cent of the business concerns had service. The charge for

a business telephone (individual line, metallic circuit) in Manhattan was a flat rate of $240 a year.

At that time the number of telephones in the Metropolitan Area, among a population approaching 4,000,000, was probably only about 18,000. In what is now Greater New York, with a population then of over 2,500,000, there were only 14,000 telephones. When, shortly before this, President Cutler of the Metropolitan Company had issued orders that plant be constructed in expectation of 20,000 telephones in Manhattan and the adjoining Bronx County, he was regarded by some as visionary.

Telephone people were anxiously at work at the infant science of rate-making as well as that of forecasting plant requirements. The result was that, in 1894, they introduced in the city the message rate plan. Revolutionary at the time, it quickly proved itself in principle and practice as beneficial to both public and company under the conditions of the metropolitan area, and has been used ever since. The cost of a business telephone in Manhattan was cut to $120 a year for 700 messages. By 1899 it was down to $75 for 600 messages. Rates in other sections were also reduced.

A marked improvement of business took place in a comparatively short time. New York's telephones rose in six years to around 50,000, principally because of the increasing efficiency of the service, its larger value to users as the number of telephones grew, and the message rate system, which was particularly suitable to the area.

While there is some question whether New York City was the first center where this plan was instituted, its success here encouraged its adoption in other metropolitan communities. It solved on an equitable basis the peculiar problems resulting from the widely varying requirements of customers in such large centers. For example, some subscribers may make thousands

of calls in the course of a year, or even a month, while others may make comparatively few, but all are entitled to a given number of local messages per month, with additional messages charged for as used. Thus the message rate plan, or measured service as it is also called, puts the charges for service more in line with the use made of it by each subscriber. In smaller communities, on the other hand, and in some neighborhoods or classes of service in populous centers, the service usage does not vary greatly, so that a flat or average monthly charge constitutes an equitable basis. Again, where a great number of telephones are concentrated, as in a big city, the cost of rendering service is greater, not only over all but per subscriber. In the telephone business, costs per telephone do not decrease but tend rather to increase with the number of telephones, although this tendency is retarded by continued effort toward economies through advancement of the art. In large cities the plant required is necessarily more complex as well as more extensive where the needs are greater, and the personnel to construct, maintain and operate it is larger. These costs are reflected in the higher monthly charge to the subscriber in the highly developed telephone center. At the same time, he has within his local calling area and vicinity so many of the persons he may wish to call or who may wish to reach him that the value of his service is enhanced. The more subscribers in the system locally or generally, the more valuable, of course, is the service to all.

Though rates have varied from time to time as changing economic conditions have affected costs, the underlying Bell System principle—of giving the best possible service for the least cost consistent with financial safety—has been steadily followed.

The War and Its Aftermath

In the quarter-century from the middle 'nineties to the close of the Great War, telephone growth in the Metropolitan Area

was rapid. Previously it had not kept pace with the steady expansion of population. Now its rate of growth far exceeded the latter. The Area's inhabitants increased by two-thirds from 1900 to 1920; its telephones multiplied about fifteen times. Extensive improvements characterized every phase of the service throughout this period. In 1902 the first "loaded cable" was installed between New York and Newark. In 1915 long distance spanned the continent. Telephones in the Area were linked with a system that had become nationwide in scope.

During the War, telephone men and women and materials were required in the nation's service. Commercial telephone construction was under embargo for two years. Among the many thousands of employees who entered War service or related activities were large numbers of skilled and experienced workers from the telephone ranks. The personnel which remained—whether at the central office switchboards or in other departments—served the country's cause as truly as those in uniform, for with depleted numbers theirs was the task of trying to maintain a service which was not only essential to the public welfare but rapidly becoming more and more in demand through the War period.

With the end of the conflict, the telephone organization in the Metropolitan Area, as elsewhere, faced enormous and unprecedented problems. It had to overcome the effects of suspended development, replace the plant reserves used up during the War, recruit and train large numbers of additional employees, and build to meet the greatest demand for service in its history. And it had to do these things while handling a volume of telephone traffic vastly larger than ever before. New buildings, new switchboards, new relays, new distributing boards, new conduits, new cables, new pole lines, new facilities of every kind were needed in greater quantities than ever, and at a time when these things were demanded by every other section of the country. Raw and fabricated materials were

difficult to obtain in sufficient quantities, and their cost rose rapidly.

Applications for telephones piled up by tens of thousands. At the peak of the demand, the unfilled applications totalled some 88,000 telephones in New York City, and in Northern New Jersey some 25,000, with additional thousands in other parts of the Area, bringing the aggregate into the neighborhood of 125,000. Telephone traffic in the Area increased by approximately a third from 1918 to 1921.

Inevitably, both during the War period and for some years following it, the quality of service was impaired. The company frankly stated its case to the public, and set itself to a task which is regarded as the greatest faced by every department of the industry in the history of telephony. Its accomplishment was the greatest achievement of its kind. The annual report of the company for 1922 contains these significant words:

> We have obtained the greatest amount of materials and equipment available and have built, assembled and added to our plant as fast as the maximum number of workers obtainable could rush it through and still maintain the standard of construction necessary for good service. This resulted in 1922 in additions to plant that exceed by far anything ever accomplished by any telephone company anywhere.

The cost of gross additions to plant in the Area, which had aggregated $18,000,000 in the year following the War, was double that total in 1920, reached $50,000,000 in 1921, and in 1924 exceeded $80,000,000. Orders for installations continued at a rate which, from 1919 through 1929, produced an average net growth of more than 140,000 telephones a year. A gain of nearly 180,000 in 1924 was approximated though not exceeded by the number added in the boom year 1929. During the period of catching up with the demand, a net total of around 1,000,000 new telephones had been added, so that in

1926 the 2,000,000 telephones in the Area were twice the number in service at the beginning of 1919.

In the space of a decade following the War the telephone plant in the Area was practically doubled in size. Moreover, the service was raised to new standards of convenience and efficiency—standards which were to reach even higher levels in succeeding years.

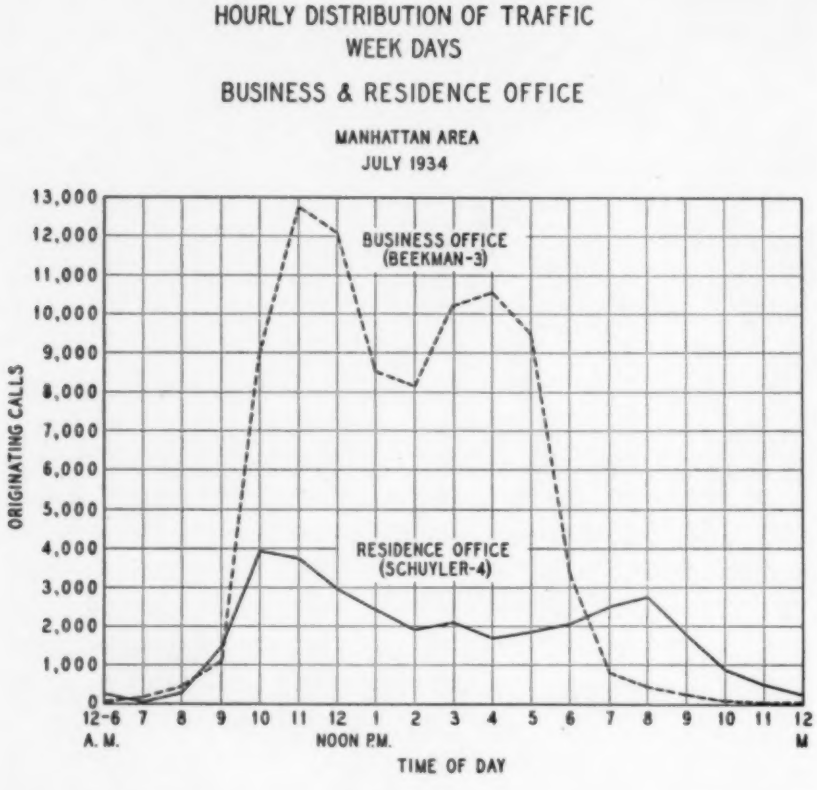
Serving the Myriad Needs of Today

Approximately a sixth of the average daily telephone conversations over the nation-wide Bell System originate from the telephones of this Area. Here is the world in cross-section, with the infinite variety of activities and relationships, needs and emotions, of an enormous and cosmopolitan population. All are portrayed in human speech, in the messages which flash daily, constantly, from telephone to telephone. To these instruments any voice is as important as any other.

The voice of the Area is never still. Thousands of calls are made even in the quietest hours of the night. Then, as during the day, operators are on duty at central office switchboards, and members of the plant forces are alert to forestall or correct troubles. Many of the troubles which might cause interruptions of service by day or night are discovered and remedied so promptly that telephone users are never aware of them. Thus during the hours when millions are sleeping the telephone is not only available for conversations but is, as always, the ally and guardian of private and public security.

As day approaches, telephones in the great wholesale markets assist in the distribution of provisions which housewives will be buying a few hours later from their neighborhood shops. Soon the new day's activities are reflected in the rising tide of calls. The commuting hosts converge upon the populous centers. Factories, stores and offices open their doors, followed soon by the banks and stock and commodity exchanges. In the residential and retail trading sections the telephone is

helping in the day's marketing and shopping. In the various marts of industry and finance, at the railroad terminals, and at the docks and warehouses, the crescendo of telephone calls moves to its peak. Now, in greater measure than perhaps at any other time of the day, the Area is linked with the nation and the world in telephone conversations. With the afternoon,



the social calls increase in the residential communities and neighborhoods, and as the business day wanes the calls between commuters in town and their homes and friends in the suburbs increase in volume. Again in the evening the calls rise in number as social plans and neighborly calls are made to points near and far. And woven through all the telephone

traffic of day and night is the record of events here and elsewhere, as the world's news is assembled and prepared for millions of readers. Through it too run those golden threads which are messages of joy and encouragement, and those darker ones which tell of human suffering and urgent needs.

The Area's * telephones which serve these myriad requirements numbered, as of July 1, 1934, about 2,255,000, of which 1,478,000, or nearly two-thirds, were in New York City. Manhattan alone had about 817,000. The Area total compares with a record year-end figure of around 2,600,000 at the close of 1929. The residence telephones slightly exceed those used for business purposes.

The average daily telephone conversations during the first half of 1934 totaled approximately 9,183,000, or about 382,625 an hour. Toll calls averaged about 490,000 daily. The general total is well over twice the traffic of fifteen years ago. New York City contributed about three-fourths of the total. The city's calls, which in the first half of 1934 averaged around 80 calls per second throughout the day, have averaged in times of pronounced business activity as high as 100 calls per second. They far exceed this, of course, in the peak hours of the business day, especially between 10 and 11 A.M., when the traffic volume is from two to three times the hourly average.

Some 14,840,000 miles of wire provide the interconnections for these telephones and the facilities for linking them with the nation-wide system and with telephones abroad. Any one of them may reach or be reached by any one of 30,000,000 telephones in this and foreign countries, or 92 per cent of the world's total. The length of telephone wire serving the Area is nearly four times the mileage in 1918. It is equal to 5,778 times the air-line distance between New York City and San

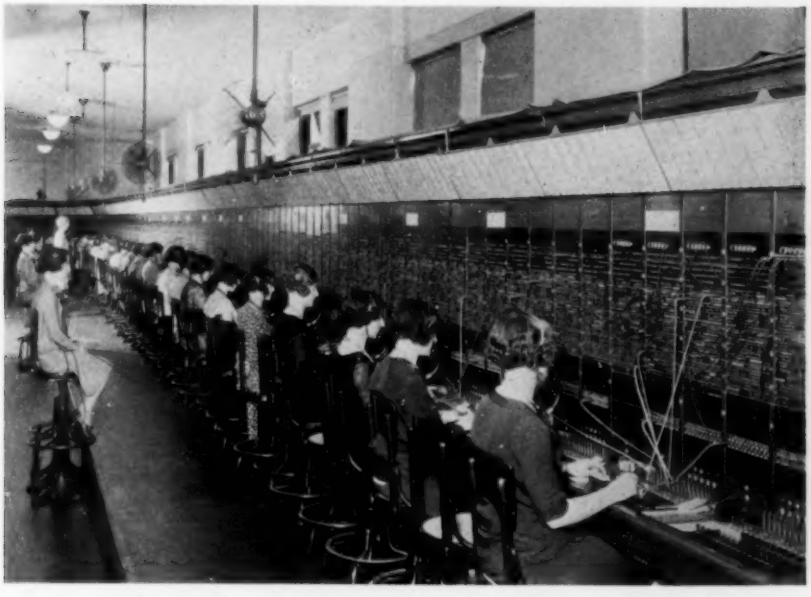
* As at various points the boundaries of the Metropolitan Census District, which is the territory mainly treated in this article, cut across telephone operating areas, it is not possible to give figures which conform precisely with that District. Some of the general figures given are, therefore, approximations, and as such are intended to give a reasonably accurate picture.

Francisco, and to nearly 600 times the distance around the earth at the equator. About 1,800,000 miles is for toll purposes. All but a fraction of one per cent of the aggregate is enclosed in protective cable, and 83 per cent is underground. In Manhattan, 98 per cent of the wire plant is below the surface.

Subscribers' telephones in the general metropolitan service area, which includes some sections not within the Metropolitan Census District, are grouped under 478 central office designations, and are served by 378 central offices, an addition of 138 since the War. New York City, with 160 central offices, has 192 designations in use, as many as the aggregate in the next three largest cities of the United States. The designations as a whole exceed those in the ten largest cities other than New York. The story of the Area's growth can be read not only in these totals but in the very character of the designations themselves. Their selection, to meet the requirements of such an Area, is as technical a task as many others in telephone engineering. Names used for such purposes are, where possible, those of the communities or neighborhoods served; but in a city or region served by many offices, each name must not only be easily read and easily spoken by telephone callers but must sound quite unlike any other used in that general section.

In addition, for dialing purposes, it is ordinarily necessary for each name of a central office within a given dialing area to have letters which provide a different combination of dial pulls from those of any other name within the areas. Thus, where there are many central offices and prospect of more, there is a limit to the suitable names which can be found. The method of designation used must meet the needs of future growth as well as present requirements. In New York City, this limit was approached several years ago. This problem has been met by giving the same name to one or more offices but adding for each office a distinguishing numeral—as, for

A New York City Central Office in the '80s, Showing "Beehive" as well as Early Desk Type Switchboards, and Both Young Women and Boy Operators



A Part of One of New York's Huge Manual Switchboards

Operators in Dial Central Offices Help in Handling Calls between Manual and Dial Telephones and to Points Out of Town

Instructing Student Central Office Operators at Practice Switchboards

example, GRamercy 5 and GRamercy 7. When another office is established in the same neighborhood, it is practicable to use the same name but with another numeral. This plan also has the merit of permitting the wider use of neighborhood names or of names with which the public has already become familiar in telephone use. For example, in New Jersey, where it was introduced prior to its adoption in New York City, one of the main purposes was to retain the locality name in the central office designation for towns and cities having less than nine central offices. This would have been impossible without such a plan. From a manual telephone, the caller gives the name and numeral, followed by the line number, to the operator. From a dial telephone within the dialing area, the caller dials the first two letters of the name, as shown in capitals in the directory, the office numeral, and the line number.

In housing the various executive, commercial and operating activities of the Area's service, 204 owned buildings and leased quarters in 173 others are used. The former include the 32-story headquarters building of the New York Telephone Company, the largest telephone structure in the world and the administrative capital for the largest operating organization and most highly developed telephone territory; the 26-story long distance building, also in Manhattan and second in size only to the former; the 20-story headquarters of the New Jersey Bell Telephone Company, in Newark; and the 27-story Long Island administrative building, in Brooklyn.

The plant and equipment for furnishing service in the Area, comprised of land and buildings, rights of way, poles, wire, cable, underground conduit, switchboards, telephones, tools, and other items in use, represent an investment, as of January 1, 1934, of some $750,000,000, or about five times the total as of the end of 1918. While the figure reflects, in common with other industries, the higher costs of materials which persisted throughout the period of expansion after the War, it

also illustrates the tendency of the costs of providing telephone facilities to increase faster than the number of telephones.

Employed within the Area in telephone service are approximately 48,000 men and women. They are so distributed among the various divisions and districts into which the Area is divided for administrative and operating purposes that each general locality is served by an organization completely equipped for the local needs and familiar with them. These telephone employees—in their number, in the character of their duties, and in their own economic and social relationships—have a vital and extensive part in the life of the communities in which they work and live and in that of the Area as a whole.

All employees who have completed specified terms of service are protected by a plan which, without cost to them, provides accident, sickness, pension and death benefits. Experience with this plan, instituted in 1913 throughout the Bell System, has shown its great value for both employees and the service, and therefore for the public. It gives the employee a sense of security which promotes interest and efficiency. It expresses the company's loyalty to the individual whose own loyalty to the service is shown by continued and conscientious effort. From the purely economic standpoint it helps to provide the company with a stabilized organization and thus to keep down the cost of rendering the service and of the rates charged to the public.

A majority—about sixty per cent—employed in the Area are women. About thirty-five per cent of the employees are related to plant work, and about thirty per cent are operators. The rest of the force comprise employees in the accounting, commercial, engineering and other departments.

Dial Service in the Metropolitan Area

About 1,210,500 telephones, or more than half of the Area's total, are served from dial central offices, of which there are 129. All but twelve of these, serving populous localities, are of the panel type. The others, in small New York communities, operate on the step-by-step method. About 69 per cent of New York City's telephones are now served on a dial basis. The Borough of Manhattan is 83 per cent on this basis.

The conditions which led to dial service in New York City are especially interesting. With the increased rapidity of telephone growth after the War, telephone engineers foresaw that it would soon be necessary to call upon automatic machinery to perform an increasing part of the task of furnishing service in the city. It had been clear for many years that it would be difficult and expensive to meet future demands for telephone connections and to continue to improve service relying entirely on manual operators.

The answer to these problems could be supplied only by the mechanical perfection and tireless operation of machine equipment. Under metropolitan area conditions, dial service is faster and more accurate than manual. Furthermore, with the dial there is less variation in the speed of connection, and, due to the fact that full operating facilities are available at all times, the dial service has a distinct advantage at night, on Sundays and at other times when manual switchboards must be operated with largely reduced forces. Dial service has become, therefore, a major factor in metropolitan service progress.*

The first installation of automatic equipment in the Area, made as early as 1914, in Newark, N. J., was of the semi-mechanical panel type, and was for the purpose of making a large-scale test of its efficiency. The first complete panel dial installation in the Area was made in Paterson, N. J., in 1922. Newark, with seven central offices, completed its conversion to

* See "Improvements in Telephone Service," by M. B. French, Bell Telephone Quarterly, January, 1933.

dial service in 1933. In 1922 a dial office was placed in operation in New York City as the beginning of its program of conversion. This office was "Pennsylvania," in a busy mid-town section of Manhattan. The engineering and operation of this office were watched with extreme interest. One of the preparatory measures was the actual dialing of thousands of calls through the apparatus. Day after day sixty girls carried on this test. Several became so proficient as to dial over 300 calls an hour, indicating also the assured proficiency of the apparatus before it was cut into service.

The severest test of dial service was provided by the enormous stock market activities of 1928 and 1929, which increased telephone traffic in the Wall Street section to unprecedented volumes. It would have been humanly impossible for a manually operated switchboard to handle the nearly 200,000 originating calls, and the additional incoming calls, which were dispatched by the Hanover dial office in a single day. This full-size 10,000-line unit, one of three offices mainly serving the Wall Street district, became the busiest office in the world, establishing new high records for the number of completed calls.

The dial system is also regarded as providing special advantages in serving a cosmopolitan population. A caller's peculiarities of speech may readily cause mistakes and delays by human operators. However, even though unacquainted with English, he need only be able to "copy" a few letters and numbers on the telephone dial to make himself promptly intelligible to the apparatus.

Even with the dial system, there are requirements for large numbers of operating employees, for toll service, for special services, and other manual operations supplementing the dial. Telephone users who dial calls to manual telephones are connected with "call indicator" positions in manual offices, where the called number is displayed in illuminated figures. The connections are then completed by the manual method. Calls from manual offices to dial offices are completed at cordless

boards—cordless because the operators complete the calls by depressing keys corresponding to the digits of the required line number. The more recent of these dial offices are so equipped that incoming calls are automatically distributed among the operators, thus expediting the service.

New York City, with its 299 square miles of area, its general north and south air line measurement of about thirty-three miles and general east and west breadth of twenty-five miles, is divided into fifteen zones for rate purposes. A subscriber's call within the city is charged as one, two, or three local messages, according to the zones involved. The maximum charge for a five-minute call between the most distant zones is equivalent to that for three local messages. With the majority of dial subscribers, calls made from their telephones to zones beyond the one-message range are made by dialing the operator and giving her the number. Their calls within the one-call range are counted entirely by mechanical message registers. In certain parts of the city from which a substantial portion of the calls are to points beyond this range, the lines of dial subscribers are equipped for the multiple mechanical registration of calls in connection with the direct dialing of calls to any telephone in any zone in the city. In Newark and the Oranges of New Jersey the multiple registration system, which was the first of its type in the country, includes all central offices with a calling range up to three units of charge.

Some Features of Toll and Long Distance Service

The efficiency of toll and long distance facilities in the Metropolitan Area is another of the great engineering achievements of modern telephony. Chief among the needs served are the constant flow of toll calls between New York City's numerous offices and those serving many hundreds of suburban points, and of long distance calls not only to and from the city but routed through this center to other distant points. All station-to-station calls to distant points throughout the country,

whether within the area or beyond it, may be placed simply by giving the place and number to the local operator.

From any one central office the larger volumes of traffic to nearby places are routed over direct circuits, but for more distant offices and the smaller volumes of traffic the "Tandem" method is used. For this purpose, circuits connect these more distant offices with a central or tandem switching board, through which the calls between any two such offices are routed. Many small groups of traffic are thus combined for more efficient routing and handling. The tandem office, therefore, is practically a central office for central offices. Four such offices in the Metropolitan Area handle calls between New York City and outer suburban points, including many places beyond the Area's limits, and also calls between points in Northern New Jersey.

Located in Manhattan but serving a wide territory surrounding it are what are called Metropolitan Tandem, Suburban Tandem, and Long Distance Toll Tandem. The tandem office for Northern New Jersey, which is of the manual type, is located in Newark. The Metropolitan Tandem switchboard was the first panel type tandem board installed in the Bell System. It handles traffic between New York City and points within a radius of about twenty miles. While tandem operators are required to advance certain types of calls coming to this board, other calls are routed to the desired offices wholly by mechanical tandem equipment.

Suburban Tandem handles traffic chiefly between New York City and points over twenty and up to about sixty miles. Placed in service early in 1931 and superseding three manual tandem boards formerly handling calls to as many separate suburban sections, it represents the most modern and efficient type of tandem equipment. Its features include call announcer machines which automatically pass numbers orally to terminating manual operators in seventy suburban offices. These ma-

chines are a practical application of the "sound-on-film" principle to telephony, translating electrical pulses into audible numerals and letters in connection with the routing of calls via panel tandem switchboards. Other features of Suburban Tandem are the automatic distribution of incoming calls to tandem operators, and an automatic trouble-recording device by which mechanical difficulties occurring during the handling of calls by the automatic equipment are reported on a typewriter.

Long Distance Toll Tandem consists of two tandem switchboards of the manual type, located in the Long Distance Office and used for establishing connections from certain local and toll boards to toll lines outgoing from the New York Long Distance Office to various small offices.

The Long Distance Office itself is a battery of offices which compose the largest long distance center in the world. It is the focal point of many important cities in the United States and to points in Canada and Cuba. Through it flashes the traffic which is handled over the radio telephone circuits to Europe and other overseas points. It is the principal control point for the great radio broadcast chains. It houses the largest teletypewriter exchange. All private wires from New York to other cities, whether telephone, teletypewriter or telegraph, are brought through this building.

From the toll and long distance offices of the city a vast network of circuits fans out into the surrounding territory, for it is the regional center for a large section of the northeastern states. Crossing from Manhattan under its surrounding waterways are forty-six toll and long distance cables, with nearly 18,000 circuits. One of many notable engineering features is the permanent subway cable-crossing under the Harlem River, between Manhattan and Bronx boroughs. Through it pass not only the toll and long distance highways between New York City and New England points, and toll routes to northern

suburban sections, but also the paths through which the greater part of the calls between the country at large and the northeastern States are dispatched. This cable-crossing, completed in 1931, is a concrete-encased iron tunnel, 614 feet long and ranging in diameter from 7 feet to 8 feet 9 inches, and containing more than 200 cable ducts. Some of its parts are said to be the largest sections of iron pipe ever cast. It lies 27 feet below the average low-tide level of this busy water connection between the Hudson and East Rivers.

As a regional center, New York is one of eight strategic points throughout the country which, under plans already largely realized, will have direct long distance connections with every other such center. In addition there will be about 150 other cities designated as primary outlets, each of which will have direct connections with one or more of the regional centers. These outlets will serve as concentration points for calls going to the particular regional center, or beyond. Newark, for example, is such an outlet for Metropolitan New Jersey, with direct connections to Philadelphia, another primary outlet, as well as direct trunks to the New York regional center and to other points. Each of the approximately 2,500 toll centers in the United States will have direct connections with at least one primary outlet. By this plan anyone in the Metropolitan Area or anywhere else in the United States will be able to reach any other telephone, regardless of distance or remoteness, through four toll switches at the most. The facilities are such, however, that a large percentage of out-of-town calls are completed through only one switching connection.

Miscellaneous Aspects of the Service

Under normal conditions, two of New York City's large office buildings have as many telephones as the entire city had in the early 'nineties. In those days a single central office could serve a section which now, in downtown Manhattan

below the City Hall, requires ten. One building in that section, at 120 Broadway, has had in banner years a population of between 11,000 and 12,000, and more than 6,600 telephones, with an average daily total of around 100,000 outgoing and incoming calls. To serve them required 2,560 trunk-line connections with central office switchboards, and riser and floor cables containing over 11,800,000 feet of wire.

The Empire State Building, the world's largest office structure, with 85 floors of rentable space above the street level and a population capacity of around 20,000, is at present equipped with nearly 31,000 feet of entrance, riser and floor cables, containing 18,555,000 feet of wire. The five 1,800-pair riser cables weigh 18 tons. Such figures indicate how important is the assistance of telephone engineers in so planning a large modern building that proper accommodations are provided for the equipment through which the telephones are to be served. The preparations also include, of course, scientific estimates of the building's telephone requirements, and the laying and connection of outside cable. Almost invariably, skyscraper structures are erected in crowded sections, where the underground plant is already extensive and complex.

To the engineering, construction and maintenance of the vast sub-surface plant are added the vital tasks of the shifting and replacement of facilities, without interruption of service, when public improvements are in progress, and their quick restoration in case of accident or disaster. The plant is so arranged that, in most cases when cables are destroyed by accident or fire, alternate routes can be quickly utilized. In major disasters, speed of restoration is, of course, all-important, and in this connection feats have been achieved which seem almost superhuman.

The most notable example, because of the scope of the disaster, was in 1927, when fire in subway construction burned off some 35,000 pairs of wires in 51 cables, contained in conduits and temporary supporting structures along the subway

route. Twenty-one thousand were subscribers' lines, and 14,000 were inter-office, toll and long distance lines. Identifying marks on cables were melted off in nearly all cases. Additional fires, coming after a good start in restoration work had been made, extended the range of trouble. Nevertheless, in approximately ninety hours after the first fire occurred, service was completely restored.

There are times when not great disasters but suddenly imposed needs bring an equal test of the emergency powers of the telephone organization. There was the time in 1933 when it seemed certain that the major facilities for securities trading would be moved from Wall Street to Newark. Within four days the New Jersey company placed a 12-duct subway for more than 700 feet, installed in the proposed new stock exchange building switchboards having five positions, wired nearly 400 hang-up handsets, and made preparations for furnishing hundreds of tie lines, foreign exchange trunks and private lines.

Private Branch Exchange Service

An exceedingly important element in the problem of rendering efficient service in the Metropolitan Area is the extensive use of private branch exchanges in offices, department stores, shops, plants, hotels, apartment houses, hospitals and other premises. Approximately 28,000 of these are in use by subscribers in the Area, the equipment ranging from small cordless or monitor boards up to manual cord boards and dial boards comparable in size with central offices serving small cities. This figure becomes the more impressive when it is noted that the total number of P.B.X. switchboards in service in the fifty largest cities of the United States is 81,000. The Borough of Manhattan alone has a fourth of the country's total. The office building at 120 Broadway has as many such switchboards as are in a typical city of 100,000 people.

A Training School in Manhattan for Private Branch Exchange Switchboard Attendants, One of Six in the Metropolitan Area

One of the Twenty-five Information Bureaus in the Area. Changes in Telephone Numbers Are Listed Here Promptly

One of the Seventeen Revenue Accounting Centers in the Metropolitan Area, Where Some 1,432,000 Subscribers' Bills Are Prepared Each Month

Expert Installation and Maintenance Make Possible the Precision Operation of Dial Equipment Twenty-four Hours of the Day

It is estimated that over half of the telephone calls in New York City and several other of the most populous localities in the Area either originate or terminate, or both, in these P.B.X. boards. In Manhattan, about seventy-five per cent of the calls come within this category. Hence the service rendered at these boards has a very large part in determining the quality of the service generally. There are approximately 35,000 attendants employed at such switchboards in the Area. In New York City they outnumber the central office operators by about three to one.

The telephone companies seek, therefore, to coöperate to the fullest extent in the training of attendants employed wholly or in part for P.B.X. operating by the various concerns and institutions. They conduct six schools in the Area—in Manhattan, Brooklyn, the Bronx, Newark, Jersey City, and Paterson—and encourage P.B.X. subscribers to take advantage of these opportunities for the instruction of attendants. Among the students of these schools from time to time, particularly in the one connected with the New York Telephone Company's chief P.B.X. bureau in Manhattan, are policemen who serve as attendants at the switchboards at Police Headquarters offices and in station houses. Between 400 and 500 members of the police force of New York City are assigned to these duties.

Placement bureaus are maintained in connection with each P.B.X. school. The bureau in Manhattan placed over 15,000 attendants from the beginning of 1929 to the middle of 1934, the annual totals ranging from 5,400 in the peak year 1929 to smaller figures in the subsequent periods. Forty per cent of the placements were in permanent positions. Many attendants obtain positions, of course, through other agencies. About 200 men and women devote their entire time to training, visiting, and other work incident to the efficient operation of these P.B.X. boards.

The largest manual P.B.X. used by a subscriber is in the Consolidated Gas Company's headquarters building in Man-

hattan, with forty-two switchboard positions and 231 central office trunks, serving at present about 2,500 extension telephones and 179 tie lines to various offices and plant premises. In busy times the traffic handled here, including interior communication service, has approached as high as 30,000 calls a day.

One of the largest dial P.B.X. boards serving a single subscriber is in the head office of the National City Bank in Wall Street. The machine equipment can handle service for about 2,500 extensions, from which local calls can also be placed without the aid of attendants. Associated with the head office are 75 branch offices, located throughout the Area, their 1,113 extensions served by smaller switchboards, which are also connected by tie lines with the headquarters switchboard. These tie lines and those to other affiliated offices number 100, and additional private lines extend to several of the largest cities. The headquarters P.B.X. has over 200 central office trunks. Incoming calls and outgoing toll and long distance calls are handled by attendants at twenty-two available positions.

Practically every large P.B.X. installation is especially engineered to meet the requirements peculiar to the customer. Such treatment is needed to such an extent that, in Manhattan, the engineering force required for this purpose is larger than the engineering organization in any one of many large cities for taking care of all central office and subscribers' facilities. A great hotel, for example, is a large community in itself, with a multitude of requirements to which the communication facilities must be so adapted as to assure the highest efficiency. Not only managers and guests but every department of operation, maintenance and service, and often a variety of shops within the premises, must be taken into consideration. Specially designed equipment will be found in each such establishment. The most extensive installations are illustrated by those in such hotels as the Waldorf-Astoria and the New Yorker, in Manhattan, each of whose private branch switchboards handle

calls to and from several thousand extensions. Each has more than 100 trunks to the telephone company's central offices. In these also, as in many other hotels, teletypewriter systems are used for handling reports concerning the arrival, change and departure of guests, and for special message and paging purposes.

The facilities serving the offices and terminals of the railroad companies furnish further examples. The largest requirements in the Metropolitan Area are those of the New York Central Lines, whose New York Terminal District extends from mid-town Manhattan practically to the northern boundaries of the Area, and the Pennsylvania Railroad, whose New York Zone includes large sections of New Jersey and Long Island as well as of Manhattan. Both companies are served by specially designed P.B.X. equipment, the switchboards located at various strategic points being connected with a main switchboard in the administrative center. The consolidated railroad ticket offices throughout the city are connected by a network of tie lines with the reservation and information desks of the various railroad companies. Public telephone facilities in the Grand Central Terminal comprise 231 booths, 61 of which are attended, and for this purpose are distributed among five switchboards, served by 103 trunks to local and toll switchboards and nineteen direct lines to nearby suburban points. In the Pennsylvania Station are 206 public telephones, including 58 booths in three attended groups.

Among the unique examples of specially designed equipment is that which serves the New York Stock Exchange, where the facilities are such as to assure the highest possible speed and convenience in connection with the rapidity and complexity of securities trading. Changes in prices are telephoned by special clerks at the trading posts on the Stock Exchange floor to quotation attendants in adjacent premises in the Exchange building. Tie lines connect brokers' offices with the quotation desks. When information is desired as to the latest price of any listed

stock or bond, the broker's office calls by special dial code the particular desk at which the records of quotations include the securities concerned in the inquiry. Orders to buy or sell are telephoned over tie lines from brokers' offices to their clerks in booths surrounding the Exchange floor, and the orders are then passed by messenger to the proper trading representatives on the Exchange floor.

Order receiving tables, or in some cases order receiving turrets, are another form of equipment in considerable use, mainly in large department stores and brokers' offices. All but a small number of these are in Manhattan, where the total is approximately 2,000. Attendants at these tables receive but do not make calls, which generally come to them through the P.B.X. on the premises. In many brokerage houses these tables receive calls wholly or in part over tie lines from affiliated offices in New York City and other cities. In the case of the large and most modern order receiving tables, the calls are distributed automatically to available receiving positions.

Directory and Information Service

All of the vast variety of engineering, industrial and commercial activities that go into the making of telephone service are directed towards one end: that whenever and wherever a person wishes to make a telephone call, he may do so with the utmost convenience, speed and satisfaction. An essential of this is comprehensive and quickly available information. To furnish it is one of the major tasks of the service, not only because of the extensive telephone usage and the great number of large and small localities served, but also because of the constant and extensive in-and-out movement of telephones and of changes from one address to another by subscribers. There are also the telephone number changes necessitated when, because of growth or service improvements, new central offices are opened or operating arrangements altered.

While the directories are issued at stated intervals, the work of compilation is a continuous task, the records of names, addresses and telephone numbers being kept up to date as the reports of new subscribers, changes, or disconnections flow daily into the directory offices. Employees engaged in compilation work in the Area totaled 365 as of July 1, 1934. New York City has five directories, one for each borough, because a general book would be too bulky for use. Manhattan's directory alone has over 400,000 listings and 1,000 pages, and Brooklyn 275,000 listings and 700 pages. As a whole they comprise over 4,800 pages of printed matter. In a recent new issue of these directories, nearly 1,650,000 copies were printed, and over 1,200,000 copies used for initial distribution—the task of delivery being a big one in itself.

Because of the many new, changed or discontinued listings from day to day, any telephone directory is in some degree out-of-date when it is issued. For the convenience of telephone users, therefore, these changes are made available promptly to Information Bureaus serving the localities involved. In both New York City and Northern New Jersey a printed record of each day's telephone installations, showing the names, addresses and numbers of new subscribers and of those who have moved, is furnished within twenty-four hours to each information operator. Every two weeks these daily records are recompiled in printed form for the use of the Information Bureaus.

Another important service is performed by the intercepting operators. When a telephone user calls a number which has been changed or discontinued, the call is passed to one of these operators, who asks "What number did you call, please?" and then gives the new number or explains that the telephone has been disconnected. She obtains her information from a numerical directory, which lists the telephones in the order of their numbers. Her records are kept up to date by daily records of changes and disconnections.

There are twenty-five Information Bureaus in the Area, served by nearly 1,400 operators and handling approximately 334,000 calls a day from points in and beyond the Area. The service in New York City is provided from eight bureaus, with an average of more than 244,000 calls daily; and in Metropolitan New Jersey from eleven bureaus, with an average of around 70,000 daily.

A problem of many years' standing in the city was the large volume of time-of-day inquiries. The old practice of asking the operator for the time became so common as to interfere with the efficient handling of regular calls. Through a succession of changes in the method of dealing with these requests, the present plan was developed, centralizing in one bureau, known as MEridian 7–1212, the time service not only for the city but for the larger communities in suburban Long Island and Westchester County, north of the city. Time announcements from this bureau, made at intervals of fifteen seconds throughout every hour of the day and night, can serve at present a maximum of over 900 simultaneous requests. Calls to the bureau from within the city averaged over 50,000 daily in the six months to July 1, 1934. Northern New Jersey also has a centralized time bureau.

The Task of Anticipating Service Needs

Despite the present enormous population of the Metropolitan Area and the unsettled economic conditions, the estimates of civic and business groups indicate that it is continuing to grow within its present limits and also to spread itself outward. New York City's population at present has been estimated at above seven and one-third millions, as compared with the Census Bureau's 1930 figure of somewhat under 7,000,000. The Regional Plan Association has suggested, as the result of exhaustive studies, a population in 1950 of more than 16,000,000 in an area taking in a territory somewhat larger than that in-

cluded in the Census Bureau's definition of the Metropolitan District. Translated into terms of the latter's boundaries, the 1950 population would approximate 15,000,000.

However accurate these visions of the future may prove to be, the telephone requirements of the Area will continue to be exacting and complex and, in the long run, will presumably greatly increase. The telephone task is both to serve efficiently in the present and to prepare for whatever public requirements the future will bring. For this additional task it is necessary to try to look ahead, not merely for one or five years, but even twenty, twenty-five and thirty years. The great and changing metropolis, with its galaxy of greater and lesser communities, presents this problem in its most various and intensive aspects.

Here, as generally throughout the Bell System, surveys by telephone commercial engineers are the attempted horoscopes, as it were, of the conditions, population, family and business groups, and per capita telephone use of every community and locality. Every important change prospective in neighborhoods, public improvements, and transportation must be taken into consideration. Revision must be made as new factors appear and as added experience suggests new judgments. What these surveys show as to indicated requirements in each center and important neighborhood are the basis upon which is built up the fundamental plan—the broad lines of change and growth along which the telephone structure must be built. For the formulation of this plan, studies must be made of various schemes of providing service, estimates drawn up of the cost and annual charges for land, buildings, switchboards, cables, and underground conduits, and computations made of operating expenses, having in mind in all of these the principles both of economy and of even higher standards of efficiency than in the past.

In this work, as in its current service, the policy and purpose of the telephone organization is identical with the interests of

telephone users and the general community: that is, service which shall always be in pace with and indeed ahead of the needs, service which shall always be as low in cost as is consistent with efficiency and with the financial integrity of the company whose responsibility it is to render it, service which shall be useful and progressive in the fullest meaning of these words.

KIRTLAND A. WILSON

Buying by Telephone at Department Stores

WHEN a commercial kitchen in Chicago is moved to undertake an extensive advertising campaign urging housewives to telephone for hot meats to be delivered in forty minutes, one might be justified in assuming that the telephone has reached the zenith of public acceptance as a buying medium. But the assumption would fall short of the truth, as hasty conclusions are so likely to do. The fact is that, although home telephone development in American cities ranges generally between 30 per cent and 60 per cent, probably not more than 5 per cent of the merchandise supplied to these homes by large downtown department stores is ordered by telephone. Considerable recent study has been inspired by this seeming discrepancy, and this article is an attempt to summarize the findings.

The most casual observation makes it clear that there is no well-defined opinion among department store executives as to the place of the telephone in the moving of goods from their shelves to their customers' homes. Present policy runs the entire gamut from definite discouragement of telephone shopping to enthusiastic cultivation of the telephone market, with the general mean resting in a zone of indifference based largely on a lack of specific knowledge.

When observed through the same merchandising lens by which the department stores view their own markets, it is not to be wondered at that telephone commercial people are looking with interest at this market for prospective telephone business. There are in the United States about 4,000 department stores. These handle somewhere in the neighborhood of a billion orders in a normal year. Every hundred orders involve a great many other contacts between store and customer. There are

inquiries about material for sale. There are matters of adjustment of bills and questions about deliveries. Certainly not less than a billion and a half communications transactions are involved—the very stuff of which telephone volume is made.

The question which must govern our deliberations is simply this: Why do not more people use their telephones in dealing with the department stores that serve them? It is not because telephones are not available to them, for a telephone is always closer to the buyer than is the store itself. It is not because the stores lack delivery facilities, for their trucks ply the streets of all our cities on regular daily schedules. And, strange as it may seem, it is not because the shoppers are reluctant to buy by telephone, for such surveys as we have made among the shoppers themselves, as later discussed, indicate a preference for the telephone method much wider than the use made of it.

We have found within the department stores themselves a large number of factors contributing to the present situation. These may be roughly summed up in four major reasons, an understanding of which brings us closer to the answer to our question.

1. Department stores are now organized to handle counter sales, with telephone sales a by-product rather than an objective.

It is one of the oldest tenets of merchandising that a face-to-face contact between buyer and seller contributes to the consummation of the sale. This is no less fundamental today than it was a thousand years ago. It explains why merchants —Babylonian, Egyptian and Roman, as well as American— have always used all their ingenuity to induce people to come to their counters. It explains the alluring counter displays, special entertainment attractions, restaurants and the thousand other devices which are the day-by-day stock-in-trade of every large modern department store. It explains the underpricing of advertised articles, the so-called "loss-leader" practice, ages old but now fallen into disrepute.

This passion to "get them in" has so long guided the minds of department store executives that it is not surprising to find many of them looking askance at plans to encourage telephone shopping, fearing that it might have the effect of keeping customers from the store. Studies made coöperatively between stores and telephone companies have seemed to indicate that telephone shopping does not keep shoppers from buying at their favorite store. What it seems actually to do is to enable them to buy at their preferred store when conditions do not permit them to visit the store in person. The store therefore gets business which it might otherwise lose. Whatever the fact may be, until a great deal more is known on the subject we are likely to find the telephone shopping bureaus continuing to be looked upon as "service" features rather than as profit-making departments to be fostered and promoted.

2. Stores are often lacking in adequate telephone equipment and in trained telephone personnel.

People who use their home telephones for shopping frequently have such unfortunate experiences in wrong material received, missed deliveries, or failure to get a prompt response from the proper department, that they abandon this method and make personal visits to the store (or to another store). This is because the telephone business is not given the same kind of attention as counter business. The truth is that the handling of telephone business is not something that can be done in casual fashion, but must be organized and planned for with all the care that characterizes a successful mail-order business.

3. Telephone orders are supposed to have a stimulating effect on "returned goods."

The acceptance of returned goods is a problem always uppermost in the merchant's mind. He looks upon it as a nuisance item having a bad effect on his operating costs and cutting down his profit margin. Some merchants with whom we have discussed the matter have been of the opinion that the ex-

pansion of telephone business tends to increase returns because the article is purchased sight unseen.

Those who have taken pains to trace returns back to the original orders have generally found that telephone orders have fewer returns than counter purchases. One store that for years had discouraged telephone business for this reason agreed to make a comprehensive study of its telephone business, but eliminated the returned goods question as an element in the study because its executives were willing to concede, *without figures,* that they had been mistaken in their view. "We have asked several stores to verify this," says the *Retail Ledger,* "and usually they are surprised to find after a test that returns from phone orders are below the average, provided the calls are handled intelligently."

In spite of these rather clear indications, the present state of the merchandising mind on this point stands in the way of more aggressive cultivation of the telephone market, and is likely to continue to do so until more stores find it advisable to establish the facts by actual reference to their own records.

4. Store advertising frequently falls short in its appeal to the telephone market.

It is not enough to have adequate telephone facilities and trained personnel. The shopping public must know that the store has them. There is only one known way to get this news abroad, and that is by the same channel that the store uses in telling of the goods it has to sell: the channel of its regular advertising. It would seem unnecessary to state this obvious fact were it not for the large number of stores that welcome telephone business but assume a telephone consciousness on the part of the buying public that is more apparent than real, and consequently fail to advertise their telephone services.

Department stores that have devoted part of their regular space to an adequate appeal to the telephone market have found an immediate upturn in orders received. In one case actually studied, telephone orders were multiplied four times within a

few months by the simple expedient of adapting the standard store signature to include its telephone number.

Adequate advertising is especially necessary to build up telephone trade in communities where the stores have previously been indifferent to it, with the result that the telephone shopping habit has not kept pace with the growth of the telephone habit generally and of the facilities available for the use of shoppers.[1]

These are by no means all the elements in the problem but they are sufficient for the present discussion.

Some study has been given in both department store and telephone quarters to reducing the present maze of guesswork and inhibition to the realm of factual data. We present the findings of one such survey, made coöperatively with a large department store in a city of the first class. The random sample of 491 orders used in this study is perhaps too small to justify a final conclusion, even in the case of this one store. But we believe the findings are indicative of the results that may be generally expected under similar conditions. The name of the store is withheld at its own request because of the intimate nature of some of the data, but we are indebted to the management for permission to use the material anonymously.

Study of 491 Telephone Orders

This store, in the spring of 1933, installed an up-to-date shopping bureau, with equipment suited to its needs and a specially trained sales group to answer calls. All shopping calls came directly to this bureau through a special number distinct from the store's regular number. For some months the bureau and its telephone number had been referred to in the store's regular advertising, resulting in a steady increase in incoming calls and a consequent increase in equipment and

[1] This subject was more fully discussed in an article "The Telephone's Place in Coöperative Advertising" in the April, 1933, Bell Telephone Quarterly.

in personnel. From this point of view the plan was fully successful, but certain of the store's executives were not satisfied that it was an economical method of selling. Nor was the telephone company fully convinced as to the extent to which it could economically go in aiding the store in its plans to promote telephone shopping.

Examination was accordingly made of 491 telephone orders selected at random from those received in the shopping bureau between March 7 and March 27, 1934, so as to determine:

1. The profit accruing to the store from its telephone business.
2. The effect that telephone business has on various phases of store operation.
3. The revenue influence of this business to the telephone company.

Two employees with appropriate telephone equipment were assigned to observe these orders and make adequate records on special forms. The articles ordered, the amount of sale, whether the article was advertised, charge or C.O.D., suggestive selling data, remarks of customers as to reasons for calling, the state of the weather, and every other item that might have a possible bearing on the problem, were recorded.

After the information had been carefully tabulated and analyzed, a complete report[2] was prepared, of which the following is a brief summarization.

1. The annual profit on the merchandise included in these orders appeared to be at the rate of 33.2 per cent on the store's stock investment, which compared favorably with the results for the store as a whole.

2. It appeared that the availability of telephone service tended to increase the total business done by the store. Many of the customers testified that they would have been unable to make the purchase from the store except by telephone. It

[2] It is obviously impractical to reproduce this report in full, but a copy will be sent to any reader who is interested in the methods of the study or the detailed results, on application either to the author or to the editor.

would also seem that the telephone did not tend to keep people from the store, since 76 per cent of the charge customers ordering by telephone also made personal visits to the store during the study period. There is a wide diversity in the type of merchandise ordered.

3. A study of the locations of customer's telephones, and reference to the message and toll records of the telephone company, indicated that these 491 telephone calls included 210 additional local messages, pay station calls and toll calls, having a total revenue value of $9.70. The additional measurable telephone revenue from these 491 calls therefore averages nearly two cents per call. This is exclusive of the revenue influence of the remaining 281 calls and the indeterminate number of other calls that these 491 calls stimulated in the nature of call-backs from the store, inquiries about deliveries, etc. Indications are therefore that every thousand incoming calls to this store have an additional measurable revenue value to the telephone company of nearly $20.

Effect of Telephone Orders on Store Profit

The following profit-and-loss summary shows in somewhat greater detail the relation of various items of expense to one another and to total sales in the case of these 491 orders:

1. Mark-up of Merchandise Sold (Sales price over actual cost)		36.4%
2. Direct Expenses		
A. Labor—Salaries at Order Board	0.9%	
B. Supervision—Portion of Adjustment Manager's Salary	0.2%	
C. Wrapping and Delivery	3.0%	
Total	4.1%	
3. Fixed Expenses		
A. Order Board Equipment—Used for Sales	1.0%	
B. Overhead	21.0%	
C. Stock Shortage	2.0%	
Total	24.0%	
4. Total Expenses		28.1%
5. Net Profit to Sales (Item 1 minus Item 4)		8.3%
6. Annual Profit to Stock Investment (based on a complete turnover four times a year)		33.2%

The question may well be asked: Can a study involving so small a group of orders in one store be considered as typical? It would be hazardous to make such an assumption. Yet there seems little doubt that if a more thoroughly organized shopping bureau had been used, one with a larger volume of business and a better trained force, the results would have been still more indicative of the profit-making possibilities of telephone merchandising.

Conditions and methods differ so considerably in different stores that what may be true of one may not be true of another. It may be of interest, however, to attempt a summary of the opinions of store managers as to how telephone orders affect some of the items of department store expense.

Personnel

There is general agreement that telephone clerks can handle more orders than counter clerks. While the exact ratio is not easy to determine, some managers have stated that as many as three telephone orders can be received in the time required to handle two at the counter.

Supervision of telephone clerks is generally considered to be more simple. There is the further possibility of economy by the shifting of telephone clerks to counter and other duties, since the telephone order peaks do not correspond with the personal shopping peaks of the store. Three-fourths of all telephone orders, for example, seem to be handled before noon in most stores, and one store testified that 80 per cent of its telephone business came between 9.30 and 10.30.

Returned Goods

We have already mentioned this important expense element. It is enough here to say that only one department store among the many with whom this matter has been discussed, with actual figures available, has found returned goods from telephone orders to be higher than from counter orders. The difference in this one case was only 1.5 per cent and seemed to

FIGURE 1. THE TELEPHONE ORDER DEPARTMENT OF MARSHALL FIELD AND COMPANY, CHICAGO

FIGURE 2. KANN'S TELEPHONE ORDER DEPARTMENT, WASHINGTON, D. C.

FIGURE 3. HUTZLER'S TELEPHONE ORDER DEPARTMENT, BALTIMORE, MD.

be due to the great emphasis placed on suggestive selling in the telephone order department. In all other cases returned goods from telephone orders were lower. The reason generally given is that people either have made up their minds about the purchase before they telephone, or they are ordering standard or packaged material. Furthermore, there is the tendency of shoppers to visit the counters to compare the merchandise of various stores before buying, making the final sale either by a second visit or by telephone.

It is safe to conclude that in most stores returned goods expense should be lower on telephone orders than on counter orders.

Delivery Expense

This is an important item, for about 38 per cent of all merchandise bought in department stores is now delivered and the trend is increasingly toward more deliveries. Since all telephone orders call for delivery, there is natural concern on this point, and it naturally resolves itself into a question of whether the store does or does not wish to sell merchandise that must be delivered. Usually the delivery systems are already so well organized that, except in peak times, any increase in telephone orders is just as likely to provide the load that makes the delivery profitable as to force an increase in this item of expense.

There is some fear that the telephone encourages hand-to-mouth buying, making for small purchases and consequently high delivery costs. Our studies indicate that, where the telephone bureau is adequately developed, there is little ground for this fear. Telephone sales amounting to several hundred dollars per item are on record. The following table of a few items selected at random is furnished us by a large New York store and indicates what we believe to be true: that the size of telephone orders compares favorably with that of counter orders and in some cases is greater

Item	Average Telephone Order	Average Counter Order
Drugs	$1.40	$1.18
Towels	No Difference	
Sheets and Pillowcases	5.30	3.75
Women's Cotton Underwear	No Difference	
Smocks and Aprons	2.05	2.35
House Furnishings	1.86	2.20

In the study of 491 orders discussed above, it was significant that many of the customers called from telephones reasonably close to the store. The proportion that came from the suburban area—about ten per cent—did not greatly exceed the proportion that came from business telephones in the downtown area. There is enough evidence, even in this small sample, to indicate that it would be unwise for a store manager to form a conclusion on this point without a specific study of the telephone orders being handled by his own store.

Telephone Expense

Consideration must also be given to the cost of telephone equipment to handle any increased volume of telephone business. Experience indicates that this expense is more than offset by the advantages that flow to the store in other directions. One large store whose annual expense for telephone equipment alone amounts to about $175,000 considers this an investment of indispensable value to the store. Nor is this surprising, for its annual gross sales by telephone amount to about $5,000,000.

Credit Expense

There is a feeling, particularly among the smaller stores, that an expansion of telephone business tends to increase the extension of credit. No indicative figures are so far available on this point, but it is significant that none of the larger stores that have had wide experience with telephone merchandising seem to be apprehensive of the effect of telephone business on their credit situation.

Equipment and Personnel

The importance of this subject may be deduced from a study made in ten department stores of a large city. Variations were found of from 18 to 47 seconds in reaching the store switchboards, 22 to 46 seconds in getting the proper department, and 18 to 80 seconds in getting the proper sales person. In other words, as much as three minutes might be consumed in establishing contact between the customer and the store employee able to handle the order intelligently. The first objective of a store in considering improvement in telephone order handling is to get this initial time down to a minimum, and this is a matter of adequate equipment and adequate personnel.

The telephone equipment that is used by department stores and the methods of handling telephone order business are almost as varied as the opinions that prevail among department store executives concerning telephone shopping. In a general way, they may be set apart in three classifications.

1. Telephone orders handled at counters

Many stores, in the matter of telephone layout, have not progressed beyond the simple method used in the first decade of telephone history. The customer's call is received by the operator at the store's regular switchboard. She determines the department selling the article desired, and switches the call to that department. The call is answered by one of the salespeople at the counter, who frequently has to leave another customer to take the call. The telephone customer repeats the order. The sales-person frequently does not know the department's merchandise at other counters and the call may again have to be switched, or another sales-person called to the telephone. In either case the order is repeated for the third time.

The confusion that results from this out-moded method is too obvious to require elaboration. It is particularly unsatisfactory from the point of view of the telephone customer be-

cause of the waiting and transfers involved with this method. Furthermore, counter customers are annoyed and inconvenienced by the clerk's attention to the telephone call. Perhaps the prevalence of this method is one of the reasons why the telephone shopping habit runs so far behind the telephone shopping inclination as developed in our surveys.

2. Shopping bureau connected with store's switchboard

At certain other stores the incoming calls from customers are switched to a special board. Boards of this type were first developed chiefly to handle adjustments, but the taking of orders is assuming even greater importance. At this board sit special operators who are able to accept the orders and forward them for attention to the proper departments. The equipment is frequently so constructed that if necessary the operator, or perhaps we should call her the telephone sales-clerk, can talk to any of the departments of the store while the customer holds the line. In this way she not only becomes expert in the technique of receiving telephone inquiries and orders, but quickly learns the proper channels of information in each department. The customer's wishes are fulfilled, with a minimum of delay and annoyance.

The equipment used in these shopping bureaus is usually in the form of a series of order turrets not unlike the positions on the common switchboard. Another development, particularly suitable for small and medium sized stores, consists of what is known in telephone parlance as "key equipment," whereby the calls are handled by means of switches on a flat-top table rather than by means of cords and plugs. Typical department store installations are illustrated in Figures 1, 2, and 3.

3. Shopping bureau with direct lines to central office

This method is a still later development of the separate shopping bureau. The equipment is similar to that described above, but it is connected directly to the telephone company's

central office and is assigned a telephone number entirely independent of the regular number of the store. One store has a separate number for charge customers alone. By proper directory listing and adequate advertising, the store's customers learn to use this number, with the result that their calls are answered by the order-taker without the delay entailed in going through the store's operators. The lines can also be held while the operator-sales-clerk converses with any department, if that is desired, although the largest stores find about 95 per cent

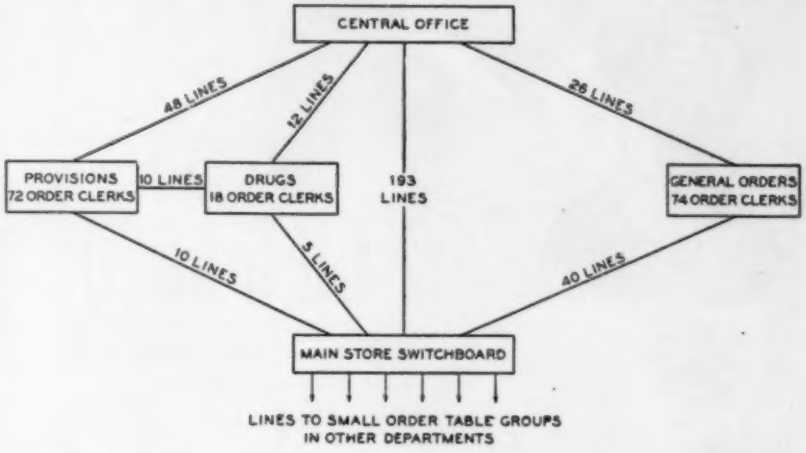


FIG. 4. A DIAGRAM ILLUSTRATING HOW TELEPHONE ORDERS ARE HANDLED IN ONE LARGE DEPARTMENT STORE. IT IS NOT UNUSUAL FOR THIS STORE TO HANDLE AS MANY AS 50,000 TELEPHONE TRANSACTIONS IN ONE DAY.

of all telephone orders handled without reference to any other department. By this means the customer has only one contact with the store, yet if direct conversation with a department is desired, it can at once be provided.

In such a telephone shopping bureau as this, sales people are selected from the trained personnel of the store because of their courtesy, the quality of their voices and their mental fitness to learn the essential details of the store's policies and merchandise. They have before them the current advertising of the store. Samples of the merchandise for which the largest num-

ABRAHAM & STRAUS
FULTON ST. at HOYT - BROOKLYN
Call CU-6-6000
Call CU-6-6000
Call CU-6-6000
It's simple to put your finger on any one of these summer sundries by calling CUmberland 6-6000
It's going to be one of this summer's most exciting indoor sports . . . calling CUmberland 6-6000 for all the things that you don't have to come to town for yourself. What with thousands of people learning to vacation in town, we expect to burn up the wires. Many more than one-quarter of a million pieces of merchandise last year alone, were sold over A&S telephones. That means that during the year, we saved about 250,000 women half a million unnecessary trips by subway. A&S has by far the greatest telephone business in Brooklyn, and, so far as we know, is second in all the United States. Our tremendous switchboard has every position filled by operators so skilled, that they have been known to fill a $800 order for Dolce Oil Heat as readily as they send a dozen golf balls over to your club. They wait on you via 'phone as efficiently and crisply as an over-the-counter salesperson. They've opened Convenient Payment Accounts entirely over the telephone. They are an expert in choosing merchandise, that many women who have never seen the face of their "favorite" telephone shopper, have come to call her a particular one who is more familiar with their whims than their own husbands. It's a stupendous thing—this faith of the community in A&S.
LONG ISLAND IS THE PLAYGROUND OF AMERICA

FIG. 5. AN EXAMPLE OF A DEPARTMENT STORE FULL PAGE ADVERTISEMENT BUILT ENTIRELY AROUND THE TELEPHONE SHOPPING APPEAL. SUCH ADVERTISING IS NOT INFREQUENT AMONG TELEPHONE MERCHANDISERS. THE USE OF EXPENSIVE NEWSPAPER SPACE TO ENCOURAGE TELEPHONE PURCHASES IS ONE MEASURE OF THE VALUE OF THIS TYPE OF BUSINESS.

ber of orders are anticipated are also nearby, so that if necessary they can describe the details to the customer. Department heads frequently instruct this sales group in the fine points of the merchandise.

It should be emphasized that, while these general terms may be used to describe what is being done in the better-equipped stores, there is no such thing as an "approved" or "best" method that can be applied to all. The best telephone shopping bureaus have developed through the years with characteristics peculiar to the store, its personnel and its problems. A telephone order department does not spring into being overnight. It is not a ready-made but a custom-made article.

For example, a variation of the central bureau method is found in one of the very largest of the telephone order departments. Individual order tables are located in several departments and calls may be routed to them from the main store private branch exchange. Some of these departments handle enough orders to justify direct lines to the central office and separate telephone numbers, so that a customer desiring to order groceries, or drugs, for example, can call the number of that department just as though it were a separate store.

The advantage of such a telephone set-up to the customer who wants to do business by telephone is obvious, and stores using this method may be expected to secure and hold the patronage of the telephone-minded customers.

It is just such a highly organized and efficient telephone shopping bureau that enabled Abraham & Straus of Brooklyn, N. Y., to say in its newspaper advertising of July 1, 1934:

> It's going to be one of this summer's most exciting indoor sports—calling CUmberland 6–6000 for all the things that you don't have to come to town for yourself. What with thousands of people learning to vacation in town, we expect to burn up the wires. Many more than one-quarter of a million pieces of merchandise last year alone, were sold over A&S telephones. That means that during the year, we saved about 250,000 women half a million unnecessary trips by subway. A&S has by far the greatest tele-

phone business in Brooklyn, and so far as we know, is second in all the United States. Our tremendous switchboard has every position filled by operators so skilled, that they have been known to fill a $500 order for Delco Oil Heat as readily as they send a dozen golf balls over to your club. They wait on you via 'phone as efficiently and crisply as an over-the-counter sales-person. They've opened Convenient Payment Accounts entirely over the telephone. They are so expert in choosing merchandise, that many women who have never seen the face of their " favorite " telephone shopper, have come to call for a particular one who is more familiar with their whims than their own husbands. It's a stupendous thing—this faith of the community in A&S.

Personnel

The training of telephone sales-clerks is just as vital as the training of any other sales group in the store. They should be under the direction of a manager and supervisors as highly skilled as possible in the store's merchandise, its delivery system and its sales policies, as well as in the peculiar problems relating to telephone merchandising itself. The manager should be of sufficient calibre to sit in with the store's management and to direct the all-important coördination of his bureau with the advertising and other departments of the store.

Space limitations forbid a full outline here of what constitutes a training program for the personnel of a telephone shopping bureau, but this is a subject so familiar to telephone people that it can be supplied locally in almost any community of size in the country.

Advertising

Given a properly-equipped and adequately manned telephone order bureau, it remains a problem of major importance to make it fit snugly into the store's merchandising plan, and particularly into its advertising practices.

It goes without saying that a department store so alive to its telephone trade as to establish such a central bureau as we have described also develops its advertising so that the customer can visualize its current offerings as nearly as possible without actually seeing them. The advertising takes on some-

thing of the atmosphere of the highly-detailed mail-order catalog and less space is devoted to the alluring "bargain" designed purely to attract the customer to the store. The telephone number appears prominently with the store's signature and is repeated throughout the advertisement to emphasize the telephone specials, frequently with the direct invitation to order by telephone.

Coöperation between the advertising and telephone departments should be a matter of hourly association. The success of the department is dependent on the proper selection of those items in each day's advertising that should have adequate telephone emphasis. At the same time the telephone specials should be well illustrated and accurately described as to size, color and price, so that the purchaser may be able to visualize the merchandise clearly. No mistake is made by the advertising departments that use direct mail catalogs as their guide in this respect.

Care must also be exercised that the advertising is so developed that the volume of telephone orders will be sufficiently uniform not to overtax the ability of the equipment or personnel to handle it. At the same time it should be designed to supply a sufficient load factor to keep the telephone personnel busy as long as it is on duty. This is a matter requiring fine judgment and supervision and much can be done by the careful determination of the best items to feature to the telephone trade, careful planning to meet the extra load of advertised sales, et cetera. Such factors have much to do with the ultimate success and the degree of profit of the telephone department and afford at the same time the best possible check upon the effectiveness of the store's advertising. A few examples of department store telephone advertising are shown in Figure 6.

If we could put added emphasis on the importance of this point we would do so. Perhaps it is enough to state that about 75 per cent of the telephone orders received in well-equipped departments are for articles currently advertised

Extra Hours for LIT Day . . . 8 A.M. to 7 P.M.
We expect the greatest response in Lit Brothers' history—and have prepared accordingly!
Mail Orders Promptly and Efficiently Filled on All Items!
Or Telephone Your Order . . . Call Walnut 8800, Day or Night . . . 24-Hour Service All the Time!
Lit Brothers-Philadelphia
Kaufmann's
Telephone Shopping Call Grant 7000
Kaufmann's Pittsburgh
'Phone CAlvert 1000
We'll Fill Your Order for You, Promptly . .
O'Neill's
O'Neill's-Baltimore
JOHN WANAMAKER NEW YORK
WANAMAKER PLACE NINTH STREET AT BROADWAY
Store Hours 9 to 5 Telephone STuyvesant 9-1700
John Wanamaker New York
Lansburgh's
Telephone TIPS
Don't worry about the weather or a pressing date that prevents you being on hand for those special values . . . Lansburgh's quality merchandise is as near to you as your telephone. Select your needs and phone District 7575. Our large corps of trained shoppers will be glad to fill your orders promptly and have them delivered to your door.
DI. 7575
yards of 39-inch
Lansburgh's Washington
39c
—EATON'S—Main Floor—Queen Street—
Clearance Children's House Slippers
A big variety of styles from EATON'S immense stock. Many straps in gay colored quality felt, with a painted design for decoration and felt on leather soles. Sizes 5, 6, 7, 8, 10, 11 and 12 in the group. Feature Special Tuesday, pair
34c
Big Special! Children's Rubbers
Take advantage of this wonderful offer to outfit the children—protect their feet against the damp weather ahead. Black service weight rubbers on a good fitting last. Sizes 3 to 10 and 11 to 2. Feature Special, Tuesday, pair
49c
Phone AD. 5011 or AD. 5311
—EATON'S—Second Floor—Queen Street—
T. Eaton&Co. - Toronto

FIG. 6. EXAMPLES OF HOW BIG-CITY DEPARTMENT STORES INVITE TELEPHONE ORDERS BY THE INCLUSION OF THEIR TELEPHONE NUMBERS IN NEWSPAPER ADVERTISING.

in newspapers. One large store sold 549 dresses in one day by keeping its telephone board open between 6 P.M. and 9 P.M. and advertising this fact.

Public Attitude Toward Telephone Shopping

In any consideration of telephone merchandising, the buying public is a factor of no less importance than the department store itself. Studies in telephone circles have not neglected this field, but have attempted to establish whether the shoppers would be likely to respond to the invitation to shop by telephone even if it were to be more generally extended to them.

Do shoppers want to buy by telephone?

Considerable uncertainty has prevailed on this point. It is not unusual to hear women say "I don't telephone my orders because I'm never sure I'll get them on time"; or "They never send what you want unless you pick it out yourself"; or "I enjoy doing my own shopping and marketing, and have time enough to do it."

Several surveys have been made in an attempt to get a rough approximation of the extent to which this negative attitude toward telephone shopping should be considered as a factor in influencing department store policy. Two of these are enough to illustrate why we feel that, at the present stage, public attitude seems to be a factor influencing the stores in favor of greater rather than less attention to telephone orders.

The first of these studies was made in a city whose home telephone development is about 40 per cent, placing it in the lower group of cities in this respect. In a series of nearly 4,500 personal interviews with householders—principally women—the question was asked "Do you use the telephone for shopping or do you insist on seeing most of the things you buy?" Analysis of the replies indicated that some 40 per cent of the telephone subscribers showed a willingness to buy by telephone.

In another city, where the home telephone development is in the high ratio of about 60 per cent, 800 telephone subscribers were asked the question "Do you like to shop by telephone?" In this case the affirmative answers slightly out-numbered the negative, 404 of the householders answering "Yes" and 396 answering "No." That is, over half were favorable to telephone shopping.

In neither of these cities does the department store business handled by telephone equal as much as 10 per cent of the total. While the per cent of merchandise which can be bought satisfactorily by telephone is not known, we are forced to the conclusion that the inclination to shop by telephone, indicated by 40 to 50 per cent of the people interviewed, is much greater than the telephone shopping actually done with department stores. We may also reasonably infer that the inclination would be still higher if the department stores in these cities were to make more vigorous efforts to reach the telephone market and were more adequately organized to handle telephone orders with accuracy and dispatch.

The principal reasons for this favorable attitude on the part of the public seem from our observation and studies to be as follows:

It saves the time consumed in traveling the increasing distances between the downtown stores and the residential sections.

It saves the inconvenience of traffic and parking conditions in the congested shopping center.

It provides a shopping opportunity for employed persons who are not free during store hours.

It permits of shopping in all weathers.

It enables the selective shopper to make her final selection without returning to the store in person.

It provides a shopping medium for those confined to home by the care of small children, or by illness of self or family.

What do shoppers buy by telephone?

This is an interesting question and one on which a fairly adequate amount of evidence is on record. We may sum up

the answer generally by saying that they prefer to order in this way articles that they have seen before, that are subject to frequent re-order, or that are either packaged or trade-marked so that they are generally familiar to the public without previous examination.

An exact record was made of the items included in the 491 orders previously referred to. That the number studied is not large merely serves to emphasize the fact that no one department monopolizes the benefits of telephone merchandising. The fact that the observation was made in early spring explains the high ranking of garden supplies. It may surprise some that shoes lead gloves, or that more hosiery is ordered by telephone than handkerchiefs and neckwear combined. However, this is not unusual and we are safe in accepting this list as fairly representative.

Toilet Articles	145
House Furnishings	136
Garden Supplies	124
Men's Furnishings	98
Lamps	89
Domestic Supplies	82
Hosiery	68
Upholstery	51
Shoes	49
Infants' Furnishings	48
Children's Furnishings	44
Uniforms	26
Ladies' Underwear	23
Boys' Furnishings	19
Library Supplies	19
Furniture	17
Women's Coats, dresses, etc.	15
Handkerchiefs	13
Stationery	11
Gloves	10
Neckwear	8
Toys	7
Luggage	6
Leather Goods	4
Sporting Goods	3
Corsets	2
Furs	1
Total	1118

The results of another study made in one of the larger stores are also enlightening as showing the distribution of telephone sales by departments, based on cash volume:

House Furnishings	34.62%	Bedding	7.76%
Rugs	12.30	Upholstery	5.24
Drugs	10.50	Table Linen	5.04
Groceries	8.82	Toilet Goods	4.83
Chinaware	8.17	Men's Furnishings	2.72

It seems rather clear from the studies that have been made up to the present time that the readiness of retail merchants to do business in the way the customer wants it done, as well as the obvious benefits to the stores in doing so, may well lead to a growing interest in telephone shopping on the part of our large department stores. It remains for the telephone companies to lend such aid as will work to the best advantage of the stores and of their customers.

JOHN M. SHAW

The author is indebted to the staff of the Commercial Engineer of the American Telephone and Telegraph Company for much of the data contained in this article and for assistance in its preparation.

Telephone Power Plants

ALEXANDER GRAHAM BELL'S original telephone depended upon magnetomotive force, generated by the vibration of an iron diaphragm in the field of a permanent magnet, for the conversion of sound waves into electrical waves. The power generated by this method was naturally weak and the distance over which conversations could be carried on was very limited. In the beginning the instruments used for transmitting and receiving were identical. It was soon recognized that if the telephone was to be a commercial success, its power output, under the direction of the human voice, must be increased. The development of the battery type transmitter followed.

With the introduction of the battery type transmitter, the vibrations of whose diaphragm controls, through carbon contacts, the current output to the telephone line, there was established in principle the transmitting medium which remains to the present day.

The average voice energy leaving the mouth of a speaker is of the order of 1/100,000th of a watt. The electrical output of the transmitter under the control of its diaphragm is several hundred times greater than the power of the voice which reaches the diaphragm. Therefore the transmitter, under the direction of the human voice, serves in the dual capacity of a converter of sound waves into electrical waves and an amplifier.

From the original battery transmitter two types of instruments have been developed: the local battery instrument, used where the power supply is individual to each telephone; and the common battery instrument, used where the power to all transmitters is supplied from one common source of energy at the telephone office.

The first commercial telephones of the battery type, gener-

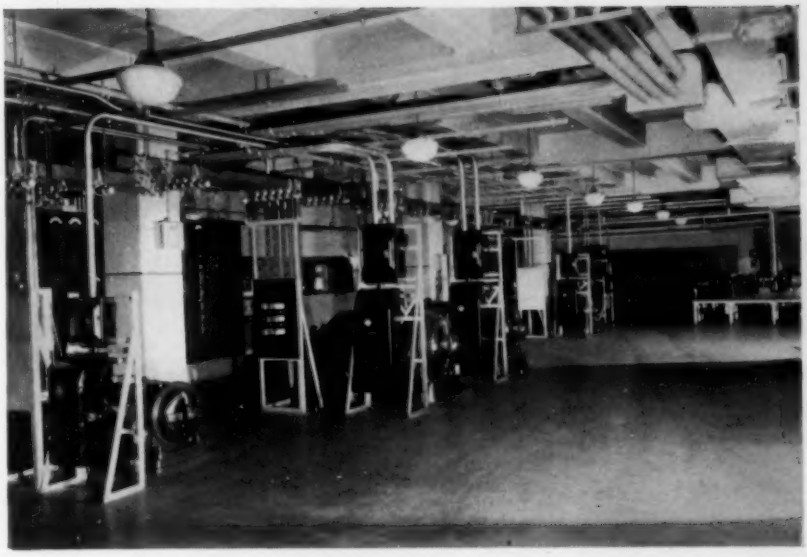
ally known as magneto telephones because of the hand operated magneto generators used in them for signaling purposes, used a local source of battery supply. This type of telephone has certain advantages, and for rural lines and small isolated exchanges it is still the most desirable instrumentality of telephony in many cases.

In the early days of the telephone the bluestone or crowfoot battery was the principal source of power. The Fuller or mercury cup type of battery was next used, then the Le Clanche cell, using carbon and zinc elements with a sal ammoniac solution, and finally the dry cell. The dry cell was rather uneconomical in its early stages of development, but with the types of dry cells available today, long service life and comparatively low cost per hour of telephone usage obtain.

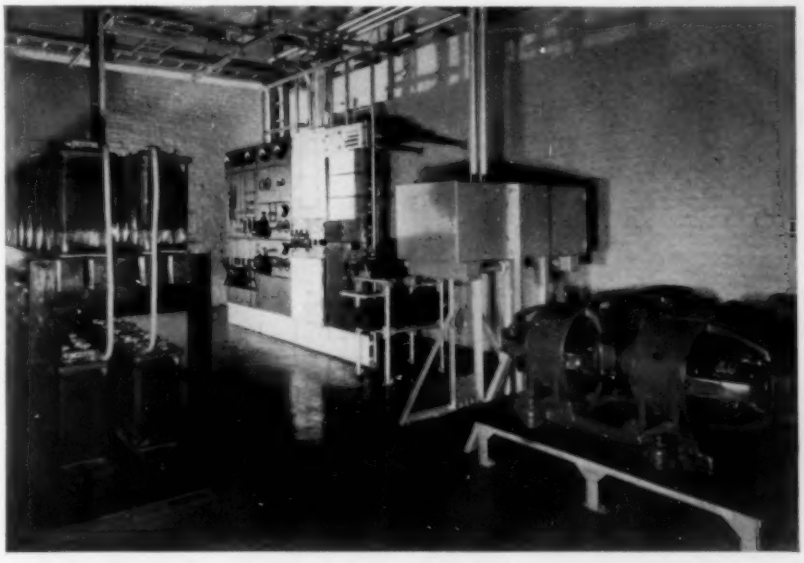
The growing demand for telephone service, the need for telephone switchboards of large capacity, and the uneconomical aspects of local battery supply under these conditions led to the introduction of the common battery or central energy type of telephone and central office equipment in the more densely populated areas.

The evolution of the common battery telephone has produced two types of service, manual and dial. Dial service is of two general types: the power driven panel, used in large multi-office areas; and the step-by-step, usually employed in medium sized and small exchanges and for dial private branch exchanges.

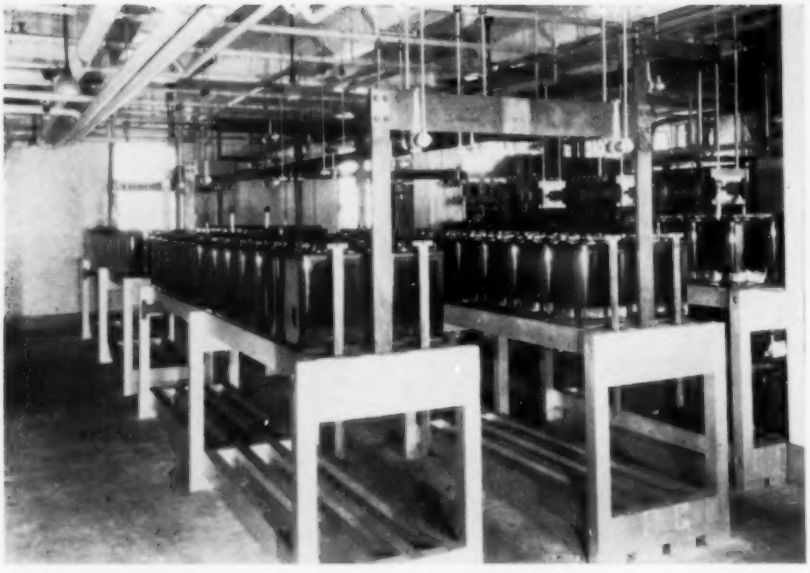
With the common battery instrument in general use commercially, the furnishing of power became a more and more difficult problem. It is apparent that the electric power requirements for the operation of two telephones over one pair of wires are not great. However, when it is considered that the number of telephones operated from a single office is very often in excess of 10,000, any part of which may be in use simultaneously, it will be realized that a real power supply problem is presented.



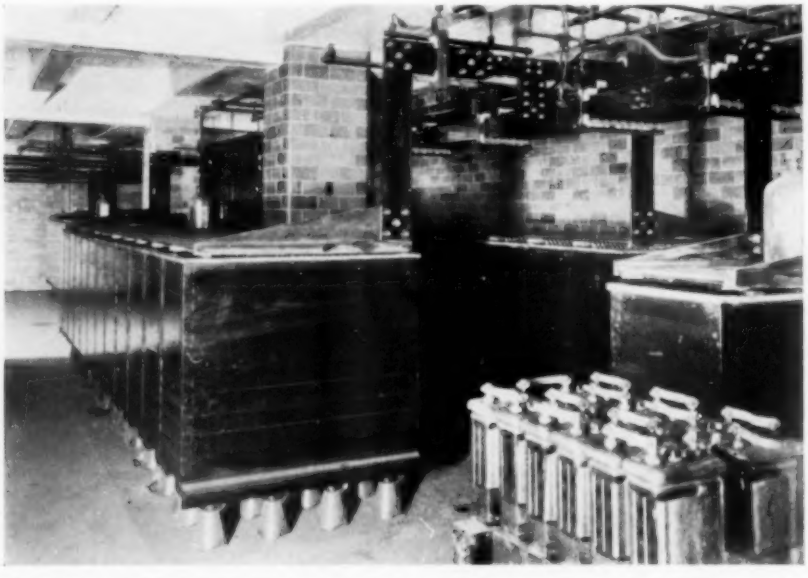
THE POWER ROOM OF THE WASHINGTON, D. C., DISTRICT-METROPOLITAN-NATIONAL DIAL OFFICES, SHOWING CHARGING MACHINES IN THE FOREGROUND AND RINGING MACHINES IN THE RIGHT BACKGROUND.



THE POWER ROOM OF THE UNITED STATES CAPITOL PRIVATE BRANCH EXCHANGE, SHOWING GLASS JAR BATTERIES AND CHARGING MACHINES IN THE FOREGROUND AND RINGING MACHINES AND POWER BOARD IN THE BACKGROUND.



ENCLOSED GLASS JAR STORAGE BATTERIES IN THE WASHINGTON, D. C., GEORGIA DIAL OFFICE. THE SPACE AT THE BOTTOM OF THE RACKS IS RESERVED FOR FUTURE BATTERY ADDITIONS.



WOOD TANK BATTERIES FOR THE WASHINGTON, D. C., DISTRICT-METROPOLITAN-NATIONAL DIAL OFFICES

Today, telephone power plants make use of 20 cycle, 135 cycle and 1000 cycle alternating current for signaling purposes; 4.5 volt, 16 volt, 24 volt, 38 volt and 48 volt direct current for talking and signaling; 110 volt positive and 110 volt negative direct current for prepayment coin box operation; and 24 volt, 48 volt and 130 volt direct current for telephone repeaters, teletypewriters and direct current telegraph. In addition, various tones are used to represent audibly certain existing telephone circuit conditions to the telephone users and to the operators.

Direct current for talking and signaling is generally furnished from storage batteries; alternating current, coin control current and tones by motor generators. In central offices where the volume of traffic is not sufficient to justify the generally used sources of supply, other sources more economical, such as dry cell operation of coin control apparatus, may be substituted.

Most of the voltages and frequencies required for telephone exchange operation are not furnished by any commercial source of supply. In view of this, and also to insure continuity of telephone service and freedom from extraneous noises, power plants for common battery offices generally employ storage batteries charged or floated by means of generators driven by motors which receive power from the commercial source. As referred to later, rectifiers are sometimes used in place of motor generators for converting the commercial power to a form suitable for use on telephone circuits.

Controlling factors in the design of a telephone power plant are: the amount of traffic (in messages) to be handled through a given office or group of offices, and the holding time, or length of time the connections are maintained between telephones. While the amount of current flowing through a telephone transmitter when connected for an average conversation is, say, 85/1000ths of an ampere, there are always at least two telephones connected and also additional current is always required to build up and hold the connections, to restore the equipment

to normal after the conversation is finished, and to operate the supervisory and signaling equipment.

For the average manual office connection 35 ampere seconds are required to build up a connection and restore the equipment and 72 ampere seconds are required for each 100 seconds of conversation. For a dial office connection 38 ampere seconds are required, on the average, to build up a connection and restore the equipment and 43 ampere seconds are required for each 100 seconds of conversation.

From this small beginning, the power required for a single connection, the power requirements increase until we find demands reaching hundreds of amperes during the peak traffic hours of the day. The generation and distribution of this relatively large amount of energy, at low voltage, without noise interference in the telephone circuits, at a minimum of cost, requires some ingenuity.

In order to minimize generator noises in the telephone system, the early charging generators were of special design supplying power particularly free from fluctuations which would introduce noise in the telephone circuits. Some few years ago adequate filter equipment, consisting of a choke coil of high impedance and low direct current resistance, together with an electrolytic condenser of high capacity, was developed. The use of this filter equipment makes it possible to employ commercial generators, with consequent lower costs. Voltage control within narrow limits is conducive to reliable equipment operation, and automatic voltage regulators can be associated with the generators as the means of voltage control.

Telephone power plant motors, motor-generators and rectifiers are operated from commercial power sources wherever this is practicable. There are relatively few places at the present time where commercial power is not available. Telephone service must be a continuous service, and not subject to interruptions due to power failures, even though these may be of very short duration and infrequent occurrence. The

telephone company is a highly interested party in the reliability of commercial power companies' service, since the continuity of this service has a direct bearing on the telephone reserve power requirements.

Motors which drive the panel dial office connecting mechanism are designed for operation from either commercial power sources or from the 48 volt storage battery of the telephone plant. Stopping of these motors results in complete failure of the telephone service within, and to and from, the office in which this stoppage occurs. Dual operation is provided so that in case of commercial power failure the motors will be automatically transferred by a switching mechanism to battery operation.

Assuming a fully charged battery at the time of commercial power failure, the reserve capacity in a given plant is generally sufficient to operate the office or offices served for several hours with normal current demand. This condition obtains where the power supply is reasonably reliable and precautions have been taken to have the power fed from two sub-stations over different feeder routes. If it is felt that there is a possibility of longer interruptions to commercial power service, the battery reserve may be increased or engine driven generators may be provided.

In the larger centers, such as large manual or dial offices, the commercial power company usually supplies the power at primary voltage into the transformer vault, where stepdown transformers are installed. From the transformer vault the low voltage power is taken to the usual house service panels for distribution to the telephone power plant. Motor generator sets then develop the required telephone plant operating power with the proper characteristics. Bus bars or leads from the generators are run to the battery control panel, where the connections are made to the storage batteries. From the battery control panel, large copper wires go to the various dis-

tributing fuse panels supplying power to the individual telephone circuits.

Fuses and switches at the battery control panel rank in current carrying capacity with those of commercial power plants, although the telephone voltages and total energy demands are much lower. As a precaution against delay in replacing blown fuses, most of the circuits leaving this panel have double-throw short-circuiting switches for by-passing a blown fuse and introducing another fuse into the circuit.

Telephone circuit design provides for arranging the power requirements of individual circuits so that one or more circuits can be supplied by a 1-1/3 ampere fuse or a 2 ampere fuse. The fuse panels and fuses are so designed that fuses of the proper capacity must be used in each circuit. Alarm circuits stand ready to call assistance in all cases of power interruption.

Economy in power costs, particularly in large telephone plants, is realized when practically all of the energy is supplied directly from the motor generators, without the losses incident to storage battery operation. Hence, the storage battery acts as a reservoir for emergencies by being permanently connected to the central office bus bars, and carries the load only during the hours when the current demand is too low to justify economically the operation of the generators.

The power requirements of an office having been determined, the design of the plant must provide for sufficient capacity and flexibility to care for the initial requirements economically. It must permit of ready expansion and provide for the ultimate office load. Bus bars, for example, are in most instances installed for the ultimate demand. Batteries are usually installed with tanks of sufficient size to care for the maximum number of plates required. The battery room for housing tank type batteries would, of course, be of maximum size for the office, from the beginning.

Recently the battery manufacturers have developed a sealed glass jar type of cell which obviates a separate battery room,

and which permits the installation of batteries adjacent to equipment. One of the many advantages of these cells is that the capacity of a given plant can be increased by installing parallel groups when and as the current requirements of the office increase.

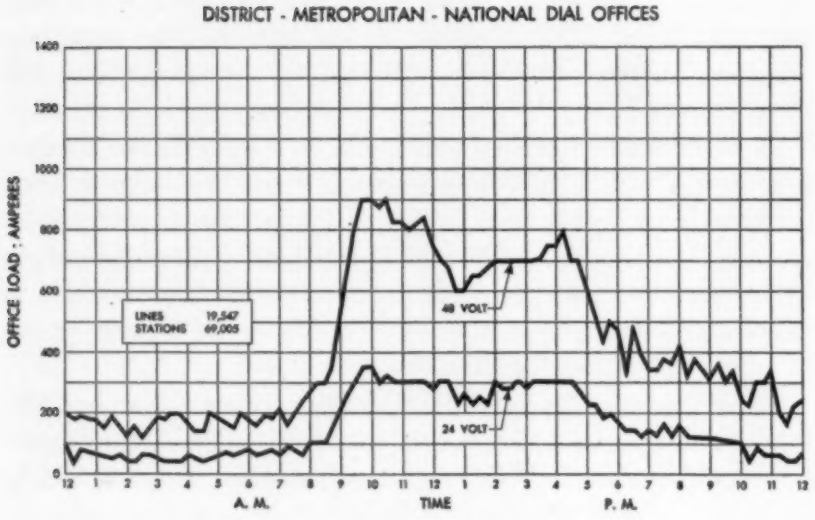
In manual offices the 24 volt source of supply carries a much heavier load than the 48 volt source, since the latter is used principally for transmitter supply on long distance connections, and for charging certain batteries at private branch exchanges which are fed from the central power plant. Conversely, in panel dial offices and in step-by-step offices the 48 volt source of supply carries the heavier load.

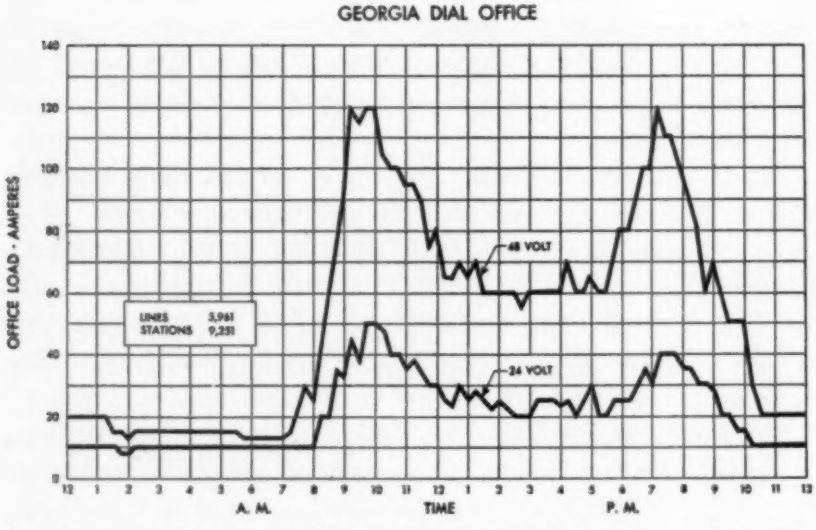
Office load records for December, 1933, in the District-Metropolitan-National and Georgia panel dial offices and North-Potomac-Decatur and Lincoln-Atlantic manual offices at Washington, D. C., are presented in graphic form, together with the number of lines in service at each office as of that period. These graphs indicate the characteristics of the traffic handled. District-Metropolitan-National offices, for example, have almost entirely business stations. While two peaks appear for the day, there is no evening peak such as is experienced in residential areas.

North-Potomac-Decatur offices serve an area that is almost evenly divided between business and residence traffic. The curves do not show the sharp falling off at the close of the business day indicated by the downtown offices, but on the contrary there is a steady volume of traffic between noon and six P.M., which then rises to a sharp evening peak, this being typical of residential service.

Lincoln-Atlantic offices are largely residential but with an appreciable business load. The drop in current consumption at the close of the business day is very marked, but the evening peak indicative of residential traffic occurs.

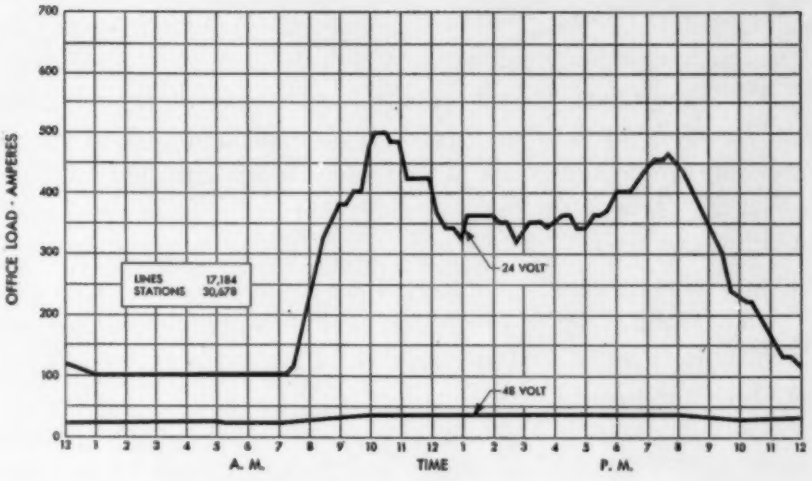
The Georgia office is almost entirely residential, with only the usual business service required in residential areas.



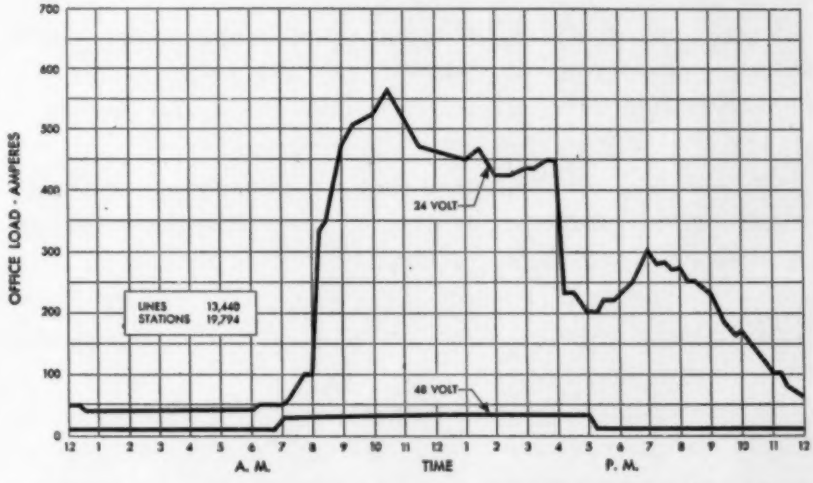


THE CHARTS ON THIS AND THE OPPOSITE PAGE INDICATE TYPICAL OFFICE LOADS OVER A TWENTY-FOUR HOUR PERIOD IN WASHINGTON, D. C., CENTRAL OFFICES

NORTH - POTOMAC - DECATUR MANUAL OFFICES



LINCOLN - ATLANTIC MANUAL OFFICES



THE CHARTS ON THESE TWO PAGES STRIKINGLY ILLUSTRATE THE PEAK OFFICE LOADS RESULTING FROM BUSINESS AND RESIDENTIAL USE OF THE SERVICE

Certain statistics for the city of Richmond, Va., are also presented in graphic form. There are two step-by-step dial centers here: Downtown, serving the principal business district, with a fair proportion of residence telephones; and Uptown, serving some business and a high percentage of residences.

The Downtown 48 volt demand has the usual high morning and close of business day peaks characteristic of central offices serving commercial districts, but there is not the sharp falling off at the close of the business day, due to the number of residential telephones. There is also the evening peak so familiar in residential areas.

Richmond, being a heavy toll and repeater point, has an almost flat load of 275 amperes at 24 volts for the operation of this equipment.

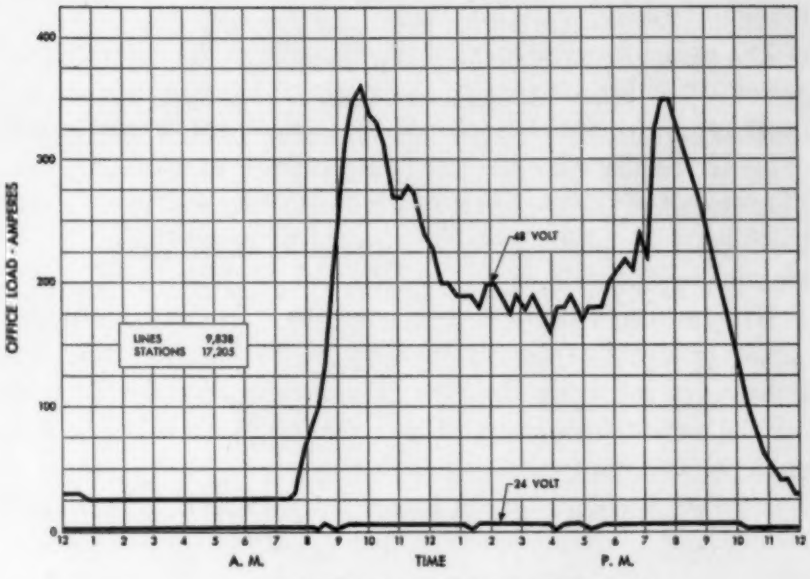
The toll board and the dial operators' board, which are also designed for 24 volt operation, are located in the Downtown building and supplied from the same power plant. Therefore the 24 volt load is very much heavier because of these power demands.

In the Uptown offices, the morning and evening power peaks, with a decided recession during the intervening hours, are indicative of residential areas. The small 24 volt demand is principally for supplying private branch exchanges.

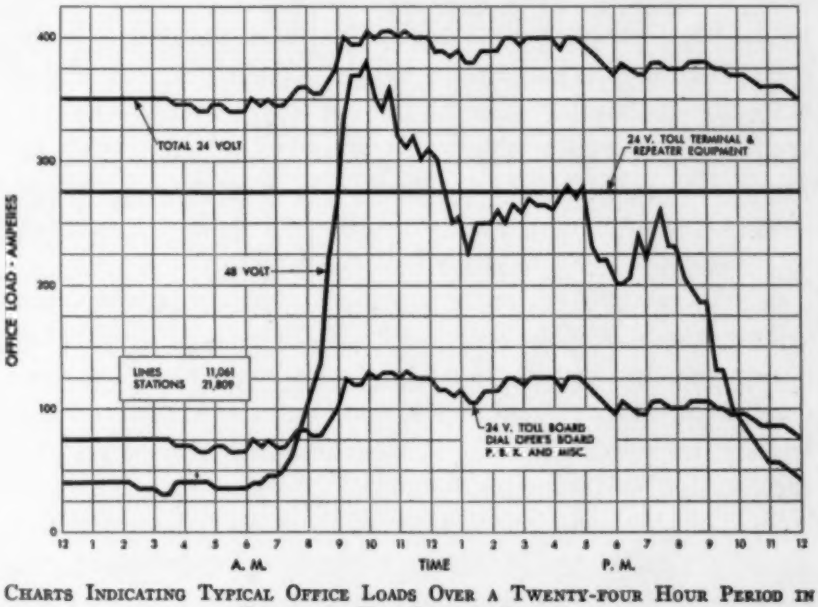
Of course, at other times during the day current drains approaching the maximum or even greater than the maximum here recorded may be experienced for short periods. Events such as a snow or rain storm, a tornado, or the passing of the Graf Zeppelin over the city are responsible for such sudden and extreme activity.

Included in the central office battery requirements is the supply for those private branch exchange switchboards whose operating battery is furnished over wires from the central power plant. Where peak demands make the direct wire feed method of supply uneconomical, floater storage batteries, charged over

RICHMOND VA. UPTOWN OFFICES



RICHMOND VA. DOWNTOWN OFFICES


OFFICE LOAD - AMPERES
400
300
200
100
0
TOTAL 24 VOLT
24 V. TOLL TERMINAL & REPEATER EQUIPMENT
48 VOLT
LINES 11,061
STATIONS 21,809
24 V. TOLL BOARD DIAL OPER'S BOARD P. B. X. AND MISC.
12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12
A. M.
TIME
P. M.

Charts Indicating Typical Office Loads Over a Twenty-four Hour Period in Richmond, Va., Central Offices.

wires from the central power plant, are used at the private branch exchange.

The use of the wire method of supply from the central plant is limited, either because of the distance between the central plant and the private branch exchange or because of the amount of power required by the particular private branch exchange. The number of private branch exchanges whose batteries cannot be directly supplied over wires from the central plant is increasing rapidly.

Whether rectifiers or motor generators are used for power supply purposes at the central office or the private branch exchange depends upon the type of power supplied by the commercial power company at the particular location, as well as upon the current requirements.

A power problem closely associated with that of supplying talking and signaling power is that of calling the subscriber's telephone. While there are many ways by which bells can be made to ring, 20 cycle alternating current is most commonly used. On single party lines, both sides of the circuit are utilized for operating the bell, while on party lines the subscribers' bells ring from either side of the line to ground. These operations require alternating current only, but experience has shown that what is known as AC–DC (alternating current-direct current) ringing current is the most satisfactory where intermittent or machine ringing is employed.

AC–DC ringing current is procured by placing a small, nine cell storage battery in series with the 20 cycle 100 volt alternating current derived from the ringing machine. The presence of the direct current component gives more positive action to the relay which stops the familiar intermittent ringing when the receiver is lifted from the hook.

To keep the calling subscriber advised as to the progress of his calls, a method of informing him when ringing current was being applied to the called line was desirable. This led to the

development of a means for diverting a small part of the ringing current through a by-pass to the calling subscriber.

Signaling between offices in a local exchange area is usually accomplished by means of direct current. When signals are to be sent to more distant offices, as in the case of toll connections between cities, the 20 cycle ringing current is used. When circuits were designed for simultaneous telephone and telegraph operation, it was found that this low frequency was not suitable, and 135 cycle current was used. Later 1,000 cycle current was introduced. Motor generators supply the 135 cycle and 1,000 cycle current. Where the load is light, vibrating relays generate the 135 cycle current and vacuum tube oscillators generate the 1,000 cycle current.

Tones of various sorts have been used for nearly a third of a century in the Bell System, for passing certain types of information over telephone circuits. With the increasing use of the dial system, some of the more generally used tones have become very familiar to the subscriber. The tones obtained from supplementary equipment associated with the ringing machines may be divided into three fundamental groups: a high tone of about 480 interruptions per second, a low tone of about 160 interruptions, and an audible ringing tone. The low tone is further modified by interrupting 60 or 120 times a minute to give the familiar busy signal.

Extension of the distances over which commercial telephone service could be given brought its own power supply problems. The level to which power can be raised in the individual telephone circuit is limited, since high power levels will introduce cross-talk in adjacent circuits in the central offices, in cables, and on open wire lines.

Successful long distance service over great distances was made possible by repeaters which came into common use with transcontinental telephony. The perfection of the vacuum tube for telephone purposes greatly facilitated the simplifica-

tion of the repeater, and materially extended the use of fine wire in toll circuits.

The increasing use of fine wire all-cable toll circuits has resulted in a marked increase in the use of telephone repeaters and the establishment of repeater stations for the sole purpose of housing this type of equipment. Repeater filaments are usually operated from a 24 volt power supply and plate current at 130 volts. Power plants for repeater stations with filament supply capacity of 800 amperes have been installed. The same precautions for continuity of service are taken for these stations as are taken for exchange service.

Direct current telegraph and teletypewriter circuits at the central office require the same power sources. They make use of 48 volt and 130 volt power supply.

Circuits equipped to handle several telephone messages simultaneously, technically known as carrier circuits, make use of vacuum tubes and other equipment generally similar to telephone repeaters. While carrier equipment is in general use, the power demand is relatively small and has not created any outstanding needs for specially designed power plants.

Development and research have materially increased the range of the present-day telephone over its forbears and have reduced the energy requirements of the individual transmitter. However, the upward trend in telephone traffic, together with the exacting demands of modern telephone usage, have resulted in greater total power consumption. From the original telephone of Dr. Bell, with the ability to generate its own electricity for transmitting sound, there has developed the world-wide telephone service of the present day with the need for power plants larger and more intricate by far than one would appreciate from consideration of the minute energy requirements of the simple connection from one telephone to another.

G. L. WELLER

The International Telephone Conferences of 1934

THE International Advisory Committee on Telephony (generally known as the C. C. I. F. to distinguish it from the similar committees for telegraphy and radio) was formed ten years ago by the joint action of leading telephone administrations in Europe, originally for the purpose of improving international telephony in the European region. This Committee completed its tenth year of work by meetings of four of the technical commissions in Stockholm on June 4 to 15, followed by a Plenary Assembly of the entire Committee in Budapest in the week September 3 to 10. These meetings crystallized the work done during the past three years by the technical commissions dealing with plant questions and during the past two years by the commissions dealing with questions of traffic, rates, and operation. They also laid out the program of work for the coming two years to be reviewed at the next Plenary Assembly, at Copenhagen in 1936.

The fact that the work of the C. C. I. F. has been highly effective is indicated by the very great improvements which have been made in international telephony in Europe during the past ten years. Ten years ago, an attempt to set up experimentally a telephone circuit between London and Rome, a distance of 900 miles, was unsuccessful even though it was preceded by months of arrangements between the engineers of the countries involved. Today, a network of efficient telephone circuits connects together the important cities of Europe. According to a survey made by the International Chamber of Commerce, in 1924 there were only 75 international telephone services in Europe, counting as one service each pair of coun-

tries between which connections could be made. Today the number reported is 414.

During this decade also the opening of commercial transatlantic telephone service in 1927 has been followed by a rapid extension of intercontinental telephone connections and has brought the total number of international telephone services, as listed by the International Chamber of Commerce, up to 1324. Anticipation of this fact was largely instrumental in leading the C. C. I. F. to expand its activities from a European to a world-wide scope and to invite the American Telephone and Telegraph Company and other telephone administrations outside of Europe to become members of the Committee. Since 1929, when the American Company joined the C. C. I. F., the Bell System has been represented at all important conferences, including both series of meetings this year.

A part of the work of the C. C. I. F. is devoted to questions for which world-wide agreement is desirable. This work is directed principally toward questions of such a nature that their coördination in the telephone systems of the different continents will facilitate the future growth of intercontinental telephone service. This includes agreement upon standards for the plant forming the continental portion of an intercontinental connection and coördination of operating practices and types and conditions of service offered. In some particulars, such coördination has already been established by the work of the Committee. In many cases, it is necessary first to reach agreement on common objectives and on common methods of measuring and expressing the technical quantities by which performance is measured.

An illustration of this which was important in the considerations of the Committee this year is given by the question of transmission standards to be applied to plant. While a few years ago the European administrations, under the stimulus of the C. C. I. F., generally adopted a standard method of using measurements of the energy efficiency of a telephone

circuit as a means of expressing its transmission performance, recently the Bell System abandoned this method in favor of measuring transmission performance in terms of service results, the so-called "effective transmission" method. The C. C. I. F. has now accepted in principle the fact that transmission performance should be rated on this basis rather than directly from the results of any technical measurements. Active work is now under way toward world-wide agreement on means for putting this criterion into practical effect, both in rating the over-all transmission performance of circuits and in determining and expressing the effect of all the various constituent elements. This involves, as one step in the process, agreement upon methods of measuring quantitatively such items as noise, propagation time, band of frequencies effectively transmitted, sidetone, echo, crosstalk, and distortions of various types, and on means of expressing the effect on over-all performance of variations in the transmission characteristics of any or all of the numerous parts of a long international telephone circuit. Material further progress was made in this whole problem as well as in other matters of interest in connection with intercontinental telephone services in the work of the Committee this year.

A considerable part of the work of the Committee continues to relate to the coördination of the European toll network. This includes numerous problems of plant construction, of commercial and operating practices, and of rates. An interesting illustration of problems of this type on which progress was made this year is the work done looking toward the establishment in Europe of a general toll switching plan of the same general nature as that adopted by the Bell System in 1929. In this work, many difficulties arise because of the fact that the governmental departments and operating companies who give telephone service in the thirty-three different European countries necessarily work, to a large extent, independently of each other. As a result, it has not been possible as yet to deter-

mine one important phase of a general toll switching plan, namely the location of regional centers and the other important switching centers. Considerable progress was made, however, in certain features of the toll switching plan, including important work looking toward specifying the transmission characteristics of the different circuit elements which may go into any long switched international connection in Europe in such a way as to insure satisfactory transmission over the completed connection.

An important trend of the work relating to the European region is the liberalization of the procedures applying to various classes of service, particularly to the person-to-person service. Further progress in this direction was made at these meetings, bringing the conditions applied to the European services somewhat closer than before to the corresponding American services.

A feature of the work of the C. C. I. F. this year is the complete rewriting of the recommendations of the technical commissions, constituting the accumulated work of the past ten years, in so far as they are still in effect. The combined recommendations of the entire Committee, which will probably fill about 1,000 printed pages, will in their new form be grouped in a logical order and published in five volumes. The final editing of this revised text will be placed in the hands of a committee consisting of representatives of France, Germany, Great Britain, Cuba, and the United States.

Practically two weeks were devoted by the working commissions dealing with plant questions to their study of these questions in Stockholm and one week was devoted to the work of the Committee as a whole in the Plenary meeting at Budapest. An efficient method of procedure has been worked out. The specific questions to be studied have been assigned to the various working commissions by the previous Plenary Assembly. Between meetings, the consideration of these questions is conducted largely by correspondence. Occasionally, there are smaller meetings in the interim, such as a meeting held in

Paris in October of last year, attended by representatives of thirteen countries, for the consideration of technical questions and of programs of tests to be carried out by the administrations and by the laboratory staff of the C. C. I. F.

When the working commissions meet, generally about three months before the Plenary meeting, the assigned questions are discussed one by one, using as a basis the past correspondence. Often, as a result of this correspondence, the chairman of the technical commission has in advance of the meeting prepared concrete proposals to serve as a basis for discussion. There are no prepared papers presented at these meetings and all discussion is directed specifically to the questions under consideration. Following the discussion, a specific recommendation with reference to each of the questions is formulated. These proposals are circulated to all the administrations who are members of the C. C. I. F. and are voted upon by the following Plenary Assembly.

The questions to be assigned for further study are carefully considered. At Stockholm one entire day was devoted to the consideration of suggestions for future work received from various sources and definite recommendations were formulated, for consideration at the Plenary meeting, regarding the work to be assigned for the coming two years.

One who attends these meetings cannot but feel that, in addition to the specific accomplishments of the C. C. I. F., in the form of recommendations for the coördination of telephone service which are accepted by the interested administrations, there is much value in this periodic personal getting together of representatives of the telephone administrations of the world. The interchange of ideas which takes place in the informal discussions outside the conference rooms and the visits to telephone offices and factories of the foreign countries have a real value. It was interesting this year to note that, in spite of the many reports received in America of unsettled political conditions in Europe, this situation did not affect the cordial

coöperation of the representatives of various European countries or prevent them from going ahead with the usual plans for a continuation in the future of their joint work for the further improvement of international telephone service.

H. E. SHREEVE,
H. S. OSBORNE

Significant Changes in the Occupational Distribution of the American Population

DURING the past quarter of a century much progress has been made in solving many of the important economic and social problems affecting the industrial life of the American people, such as child labor, long working hours, sweatshop conditions for women, and unsatisfactory living standards. This progress has resulted largely from technical advances, increased labor efficiency, and improved management, while the status of the workers has been bettered by many social reforms and improvements in working conditions which have contributed to higher standards of living. These improved living standards have in turn created a better market for American goods, for new products, and for additional services, and the satisfaction of these wants has originated a new labor demand, thus tending to absorb the surplus workers displaced by technological developments. The present depression may have served temporarily to retard this progress in some directions, but it does not alter the fact that the gains up to 1930 were substantial and significant.

The far-reaching economic and social changes wrought in the United States during the 1910 to 1930 period[1] are reflected in the occupational statistics recently published by the Bureau of the Census. The figures on workers in various occupations tell the story of the expansion of many long-

[1] In the Thirteenth (1910) Census report on "Occupation Statistics," the Bureau of the Census, for the first time, published detailed statistics showing, for each of the more important industries and for each service group, every occupation that was numerically important, with the workers in the occupation classified by sex, color, nativity, and age. In 1930 the Census Bureau made its second attempt to classify the gainful workers both by industry and by occupation. In general, therefore, comparison of 1930 occupation statistics with those of 1910 should be more enlightening than comparisons between other census dates.

established industries and of the amazing growth of several new lines of activity, simultaneously with the waning of some old professions and trades.

Moreover, changes in the distribution of gainfully occupied workers among the basic industry and service groups and developments tending to improve the economic and social status of the working population have special interest to the telephone industry in so far as they affect the market for its facilities and services. It may, therefore, be worth while to consider briefly the important changes that took place in the number and distribution of workers by occupations during the past two decades and then try to evaluate their significance.

Gainful Workers[2] by Industry and Occupation

While the total population in the United States increased by one-third between 1910 and 1930, the change in the number of gainful workers in various industries differed markedly from this figure, several occupational activities gaining relatively much faster than did population and some even declining numerically. Such disproportionate changes can be accounted for by several factors.

In the first place, improved living standards since 1910 contributed to a considerable increase in the service industries (catering largely to domestic and personal needs, but including also governmental activities and professional pursuits in the fields of education, health, law, engineering, and entertainment). The gainful workers in these occupations increased by nearly 3,200,000, or 53.5 per cent, during the twenty-year period. In a general way, this reflects the social progress of the American people as well as the greater complexity of life under city conditions; nearly 27,000,000 more people lived in urban territory in 1930 than in 1910.

[2] The Census enumerators were instructed to include as "gainful workers" all persons who usually follow a gainful occupation, although they may not have been actually employed when the census was taken.

In the second place, and closely related to the foregoing situation, certain household functions have been transferred from the home to the shop and factory where they can be performed more efficiently and economically. For despite the greatly increased use of gas and electricity for cooking and household tasks, which lessens somewhat the labor previously involved in the use of coal, wood or oil, the kitchen seems to be used less than it was 20 to 25 years ago. This trend is indicated by an increase of 474,000 workers (109 per cent) in the food industry from 1910 to 1930—including bakeries, butter and cheese plants, and fruit and vegetable canning factories—and by an increase of 172 per cent in the number of restaurant, cafe, and lunchroom keepers during this period. A somewhat similar situation prevails in the slaughter of livestock for food. Whereas much of the slaughtering was formerly done on the farm or ranch where the meat animals were raised, the increase of 76,500 (87 per cent) in the number of workers in slaughter and packing houses since 1910 indicates that this operation has been largely transferred to industrial plants which are better equipped to handle the work.

Accompanying the increased absorption by commercial interests of certain domestic duties have been marked declines in the number of workers dependent upon employment in the home. For example, there were 172,700 (33 per cent) fewer independent launderers and laundresses in 1930 than in 1910, against an increase of 128,400 (114 per cent) in the number of laundry operatives; also in the same period there was a decline of 291,000 (65 per cent) in the number of dressmakers and seamstresses (not in factories). Thus, it is apparent that several basic occupations characteristic of the home have been taken over in increasing volume by organized industry during the past two census decades.

Finally, the rapid expansion of industries just getting under way in 1910, such as the automobile and electrical industries, and the rise of new industries, such as radio, aviation, and

rayon manufacture, have provided employment for a vast number of workers. These developments have been particularly fortunate in view of the displacement of industrial labor by technological improvements.

The rise of some industries was facilitated and accompanied by a decline in the importance of some related activity. For example, the rapid development of the automobile was coincident with the decadence of horse-drawn transportation. While the gainful workers in automobile manufacturing plants increased by 535,000 (506 per cent) from 1910 to 1930, the number employed in wagon and carriage factories declined from 83,400 to 9,200 and the workers in harness and saddle factories dropped from 33,100 to 9,100. Between 1910 and 1930, dealers in automobiles and accessories increased from 4,600 to 61,500; garage owners, managers and officials increased from 5,300 to 70,000; and chauffeurs, truck and tractor drivers increased from 45,800 to 972,400. The number of workers employed in automobile agencies, and stores, filling stations, garages, greasing stations and automobile laundries—too few in number to be mentioned in the 1910 census—totalled 791,000 in 1930. During the same period, draymen, teamsters, and carriage drivers declined by 333,000 (75 per cent), blacksmiths by 108,000 (47 per cent), and hostlers and stable hands by 56,700 (90 per cent).

Certain occupational pursuits which showed only slight losses in workers, or even small gains, over the past two decades experienced sizeable declines in the number of gainfully occupied workers from 1920 to 1930. For instance, in agriculture, the abandonment of some marginal farms and the consolidation of other farms accounted for a reduction of 375,350 (6 per cent) in the number of farmers between 1920 and 1930. More widespread adoption of machine equipment in coal mining largely explains why there were 112,300 fewer coal operatives in 1930 than in 1920, while at the same time the increased use of automatic machinery in manufacturing released 161,600

machinists. Of course, there has been a great increase in the efficiency of men, machines, and methods during the past two decades, so that the output per worker has grown tremendously. This reflects the progress realized in industrial production since 1910, due largely to technological advances.

The decline in the importance of agriculture is further indicated by the fact that of the nearly 6,300,000 farm operators in 1930, about 1,900,000 reported 190,000,000 days of work for pay in 1929 at jobs not connected with the farms they operated. This was an average of 100 days per farm. Of those who worked off their farms, 14 per cent (or 267,000) reported 250 days or over, the average number of days being 302. It is clear from these figures that the farming operations of a very large number of these operators were incidental and supplemental to a wide range of other occupations.

The supervisory personnel in the manufacturing and mechanical industries—including managers and officials, foremen and overseers—increased from 300,000 in 1910 to 650,000 in 1930, nearly four times the proportional gain in all other workers in this group. This may reflect the increased complexity of modern manufacturing methods requiring greater emphasis on management and supervision of production than formerly.

Some of the principal divisions of industry which experienced notable gains in workers between 1910 and 1930 are shown in Table 1.

Number and Sex

Half the people in the United States 10 years old and over in 1930 were persons usually working at gainful occupations. And of the total population recorded at the last census, approximately 2 out of 5 were classified as gainful workers. Although there were about 11,000,000 more workers in 1930 than in 1910, the proportion gainfully occupied, both in the total population and in the population 10 years old and over, decreased materially over the 20-year period. While this de-

TABLE 1. INCREASE IN GAINFULLY OCCUPIED WORKERS, 1910 TO 1930, FOR INDUSTRY OR SERVICE GROUPS HAVING SIZEABLE GAINS

Industry and Occupation	Increase in Workers	
	Number	Per Cent
Extraction of Minerals—		
Oil wells and gas wells	143,141	260
Manufacturing—		
Automobile Factories	534,716	506
Blast Furnaces and Steel Rolling Mills	219,855	55
Car and Railroad Shops	96,078	74
Electric Light and Power Plants	220,197	320
Electrical Supply Factories	294,655	322
Food and allied industries	473,694	109
Furniture factories	107,827	67
Gas Works	61,680	116
Knitting Mills	66,898	62
Paper and Pulp Mills	88,993	98
Petroleum Refineries	144,081	485
Printing and Publishing	188,932	53
Rubber Factories	108,291	187
Silk Mills	74,868	78
Transportation and Communication—		
Construction and maintenance of roads, streets, sewers and bridges	217,195	92
Postal Service	114,116	67
Telephone and Telegraph Companies	309,695	115
Trade—		
Banking and Brokerage	414,071	197
Insurance	354,335	232
Real Estate	136,172	90
Wholesale and Retail	2,273,744	64
Public Service	516,823	97
Professional Service—		
Teachers	463,378	77
Technical Engineers	137,494	155
Trained Nurses	211,862	257
Domestic and Personal Service—		
Barbers, Hairdressers, and Manicurists	179,015	92
Cleaning, dyeing & pressing	73,258	493
Janitors and sextons	196,544	174
Laundry Operatives	128,440	114
Restaurant, cafe, and lunchroom keepers	104,574	172
Waiters and waitresses	204,995	109
Cooks	114,952	26
Other Servants	311,956	28
Clerical Occupations—		
Bookkeepers, cashiers and accountants	443,948	91
Clerks (except in stores)	1,276,502	177
Stenographers and typists	494,497	156

crease was general, it was, in fact, greater for males than for females, greater for children than for adults, greater in the South than in other sections of the country, and greater in agriculture than in other occupational fields.

The total number of males 10 years old and over who were reported as gainfully occupied in 1930 was 38,077,804, or 76.2 per cent, compared with 81.3 per cent in 1910. This decline was due only in very small part to a change in the age composition of the working population. Rather, it can be very largely accounted for by the increased school attendance and by more general and earlier retirement from active work.

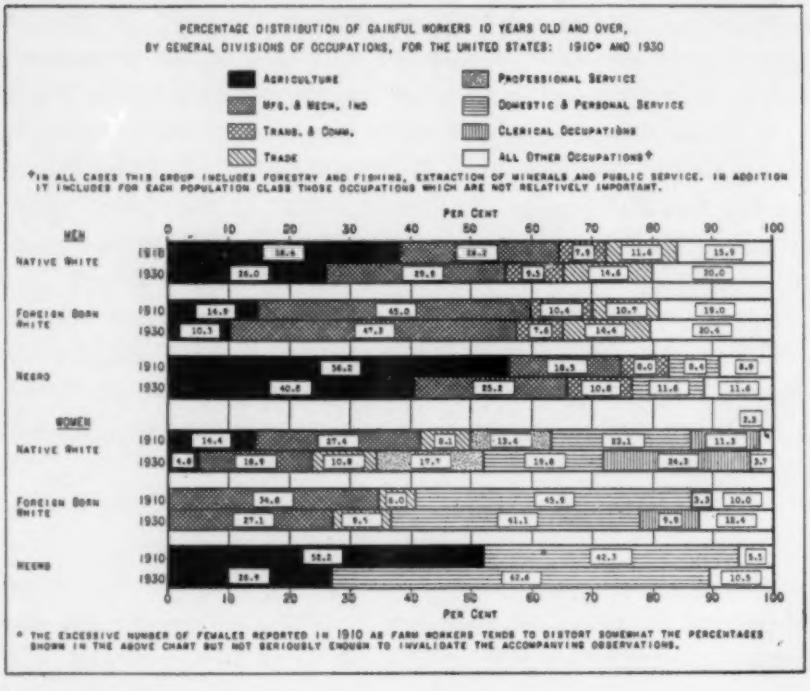
A direct comparison of female workers in 1930 with the corresponding number in 1910 is not practicable because of certain peculiarities in the census count in the latter year.[8] However, the proportion of females 10 years old and over gainfully occupied in 1930 was 22.0 per cent as compared with 21.1 per cent in 1920, which continues the trend that has been in evidence since 1870, with the exception of 1910 already explained. This emphasizes the increased importance of women in industry during the past decade, a development that will receive further attention in a later section.

Color and Nativity

Although the native-white class has the smallest proportion of persons 10 years old and over gainfully occupied—the percentage declining from 49 in 1910 to 47 in 1930—this population class has formed an increasing proportion of the total number of workers, rising from 65.4 per cent to 72 per cent during the 20-year period. This was due largely to the reduction of 400,000 foreign-born white workers between 1910 and 1930, but reflects also the fact that during this time the native

[8] There is considerable evidence that too many women were reported as farm laborers in 1910, the figure of 1,522,000 representing an apparent increase of 860,000, or 130 per cent, over 1900. The excess number reported was confined largely to farm laborers working on the home farm, and was due to a difference in the instructions to enumerators at the two censuses.

white population of working ages increased much more rapidly than the corresponding negro population. Negro workers increased by 310,000 from 1910 to 1930—although they were outnumbered in 1930 by the foreign-born whites by nearly 2,000,000—while the other races gained 540,000 workers. (This figure is partly fictitious, due to the fact that Mexicans were counted as a separate class for the first time in 1930.)


PERCENTAGE DISTRIBUTION OF GAINFUL WORKERS 10 YEARS OLD AND OVER,
BY GENERAL DIVISIONS OF OCCUPATIONS, FOR THE UNITED STATES: 1910* AND 1930
AGRICULTURE
MFG. & MECH. IND
TRANS. & COMM.
TRADE
PROFESSIONAL SERVICE
DOMESTIC & PERSONAL SERVICE
CLERICAL OCCUPATIONS
ALL OTHER OCCUPATIONS†
†IN ALL CASES THIS GROUP INCLUDES FORESTRY AND FISHING, EXTRACTION OF MINERALS AND PUBLIC SERVICE. IN ADDITION IT INCLUDES FOR EACH POPULATION CLASS THOSE OCCUPATIONS WHICH ARE NOT RELATIVELY IMPORTANT.
PER CENT
0 10 20 30 40 50 60 70 80 90 100
MEN
NATIVE WHITE
1910 18.6 28.2 7.9 11.6 15.9
1930 26.0 29.9 9.5 14.6 20.0
FOREIGN BORN WHITE
1910 14.9 45.0 10.4 10.9 19.0
1930 10.3 47.3 7.5 14.4 20.4
NEGRO
1910 36.2 38.9 8.0 8.4 8.9
1930 40.6 25.2 10.8 11.6 11.6
WOMEN
NATIVE WHITE
1910 14.4 27.6 0.1 13.6 32.1 11.3 2.3
1930 4.8 10.9 10.8 17.7 19.8 24.3 3.7
FOREIGN BORN WHITE
1910 34.8 6.0 45.9 3.3 10.0
1930 27.1 9.5 41.1 9.9 12.4
NEGRO
1910 52.2 42.3 5.1
1930 26.9 62.6 10.5
0 10 20 30 40 50 60 70 80 90 100
PER CENT
* THE EXCESSIVE NUMBER OF FEMALES REPORTED IN 1910 AS FARM WORKERS TENDS TO DISTORT SOMEWHAT THE PERCENTAGES SHOWN IN THE ABOVE CHART BUT NOT SERIOUSLY ENOUGH TO INVALIDATE THE ACCOMPANYING OBSERVATIONS.

Incidentally, the negro race has the highest proportion of any population class of those aged 10 years and over gainfully occupied, although this percentage declined from 71 in 1910 to 59 in 1930.

The figures in the accompanying chart show the reduced importance of agriculture in 1930 for both sexes of all nativity groups as compared with 1910, although it is still a major activity for negroes and native white males. Manufacturing

and mechanical pursuits have attracted an increased proportion of all male workers—notably negroes—while employing relatively fewer white women. There have been rather heavy gains in the proportion of white workers engaged in trade. Proportionally large numbers of white women were drawn into professional service, mostly as school teachers and trained nurses, while at the same time this nativity class declined in relative importance in the field of domestic and personal service. Negro women apparently transferred their activities in large numbers from agricultural labors to domestic and personal service, until in 1930 five of every eight colored women were classed as servants. But perhaps the most pronounced increase between 1910 and 1930 was that of white women working at clerical occupations, associated principally with trade and professional pursuits.

Age of Gainful Workers

The increased concentration of workers in the broad age group 20 to 64—the proportion rising from 83.7 per cent in 1920 to 85.8 per cent in 1930—resulted from the marked decline in child labor (10 to 15 years) and in young workers (16 to 19 years). Although the figures for earlier censuses are not exactly comparable with those for 1920 and 1930, such statistics as are available for 1910 and 1900 indicate that this concentration of workers in the middle age groups has been the result of a continuous trend in this direction for several decades. This concentration has been more pronounced among women than among men.

As might be expected, the proportions both of males and females gainfully occupied in all age groups between 20 and 64 were higher in 1930 than in 1920, except among males 20 to 24 years old, in which group there was a moderate decrease. There was also a slight decline in the proportion of males 65 years old and over gainfully occupied. Furthermore, for each sex, there was a striking and general decrease from 1920 to

TABLE 2. AGE OF GAINFULLY OCCUPIED WORKERS; 1930 AND 1920 *

Age Group	Percentage Distribution of Gainfully Occupied						Proportion of Persons Gainfully Occupied					
	Total		Male		Female		Total		Male		Female	
	1930	1920	1930	1920	1930	1920	1930	1920	1930	1920	1930	1920
10 years and Over.....	100.0	100.0	100.0	100.0	100.0	100.0	49.5	50.3	76.2	78.2	22.0	21.1
10 to 15.....	1.4	2.5	1.2	2.2	1.9	4.1	4.7	8.5	6.4	11.3	2.9	5.6
16 to 19.....	8.2	9.5	6.7	7.7	13.6	16.5	43.4	52.3	55.8	68.0	31.3	37.0
20 to 24.....	14.6	14.2	12.6	12.5	21.8	21.1	65.7	63.9	89.9	91.0	42.4	38.1
25 to 44.....	45.7	45.7	46.7	47.1	42.3	40.0	61.7	60.7	97.5	97.2	25.4	22.4
45 to 64.....	25.5	23.8	27.6	25.9	17.8	15.8	58.0	58.2	94.1	93.8	18.7	17.1
65 and Over....	4.5	4.1	5.1	4.5	2.5	2.3	33.2	34.3	58.3	60.1	8.0	8.0
Unknown.....	0.1	0.2	0.1	0.2	0.1	0.2	47.3	48.9	59.9	61.5	31.8	28.0

* Corresponding figures for 1910 are not available on a comparable basis.

1930 in the proportion of children and young persons 10 to 19 years old who were gainfully occupied. This decline is significant and deserves further attention.

CHILDREN IN GAINFUL OCCUPATIONS

Notwithstanding an increase of nearly 3,500,000 in the number of children 10 to 15 years old in the United States between 1910 and 1930, the number of such children gainfully occupied decreased from 1,990,000, or 18.4 per cent, in 1910 to 667,000, or 4.7 per cent, in 1930. This decline resulted in part from improved standards of living and in part from increased legal restrictions upon child labor, better compulsory school attendance laws, and more efficient enforcement of these two classes of laws.

Over 70 per cent of all gainfully occupied children in 1930 were reported as engaged in agriculture, with seven out of every eight of those so engaged being classified as unpaid family workers. This means that only two-fifths of the total number counted as occupied were actually working for wages. The

great bulk of those not in agriculture were divided between the manufacturing and mechanical industries, trade, and domestic and personal service. Geographically, the degree of child labor appears to have varied inversely with the general standard of living and the extent of small farming, as the proportion of children gainfully occupied is highest in the southern states and lowest in the northeastern and far western regions.

The distribution of gainfully occupied children by population classes is in the ratio of approximately two native whites for each negro, but the proportion of total native-white children reported as working in 1930 was only 3.3 per cent as compared with 16.1 per cent for negroes. These percentages were much higher in 1910, when the corresponding figures were 14.3 and 46.6, respectively. This comparison emphasizes the marked reduction in child labor which has taken place during the past two census decades.

Extent of Gainful Employment Among Old People

In analyzing the changes in the number and proportion of old persons gainfully employed, a direct comparison between 1930 and 1920 is possible only for the age group 65 years and over. However, this is quite satisfactory because, in general, age 65 represents the dividing line beyond which the operation of industrial pension systems becomes effective and it also marks the point at which old age dependency begins to be a real problem. In view of the fact that those aged 65 and over formed 5.5 per cent of the total population in 1930 as compared with 4.7 per cent in 1920, and that the proportion of persons in this age group who were gainfully occupied declined slightly during this period, it is evident that the importance of old age as in itself a potential cause of dependency is becoming more serious.

In spite of the fact that a person 65 years old or over finds it difficult to secure or retain profitable employment, a con-

siderable proportion of the people in this age group are still gainfully occupied, amounting to one-third of the total number. As might be expected, the extent of gainful employment varies widely between the sexes, slightly less than one-twelfth of the women and nearly three-fifths of the men coming within the group. While some of the 1,400,000 males 65 years old and over who were not employed in 1930 were undoubtedly independent, nevertheless this number represents some measure of the extent of old age dependency.

With few exceptions, the southern and far western states have from three-fifths to two-thirds or more of their aged males gainfully employed, while in the northeastern and north central regions the corresponding proportions are well below the national average. This alignment follows the usual experience that agricultural and rural conditions afford more opportunities for elderly workers to continue in gainful employment than urban and industrial environments. The size of the negro population also appears to affect the situation, as there are indications that the colored people tend to continue in gainful employment to a later age than the non-colored races.

The states leading in the employment of elderly women show a somewhat similar alignment to the proportion of old men gainfully occupied. In the distinctly southern states, this situation is probably due to the fact that the majority of employed women are colored, and that they are engaged mainly in domestic service or in agriculture, in both of which there are more chances for an elderly worker to be useful than there are in industrial pursuits.

Women in Industry

The number of female workers in industry more than doubled between 1900 and 1930, with the decade 1920–1930 showing an increase of 2,200,000 employed women. One important factor in the movement of women into industry has been the shift of several occupations such as baking, canning and pre-

serving, laundering, and sewing from the home to the factory; all this has reduced the economic importance of woman in the home. The tendency has been for her to seek outside employment, with the consequence that a wholesale shift from the kitchen to the office, store, and mill has taken place, thus emphasizing the increased economic independence of women during recent decades.

While most occupational groups recorded substantial gains in female workers between 1920 and 1930, there were two broad industrial fields in which the number declined; agriculture by 173,000 and manufacturing by 44,000. However, these losses were wholly or largely due to the reduction in child labor, as the number of girls 10 to 15 years of age reported as gainfully occupied in agriculture decreased by 62,000 and in manufacturing by 48,000 during this decade.

The other principal industrial groups employed very sizeable additions in the number of women during the past census decade; 290,000 in trade, 509,000 in professional service (the teaching profession is the stronghold of women), and 565,000 in clerical occupations. But the most abundant new opportunities for woman's energy during the 1920's occurred in the personal service division—in the fields of beautifying, waiting on table, and domestic service—where employment was provided for nearly 1,000,000 additional workers. These may be regarded largely as luxury or prosperity trades. In fact, most of the service and clerical occupations in which women predominate are either prosperity or office routine jobs.

The entry of married women into outside occupations has been rapid in the decade 1920 to 1930. During this period the number of married women gainfully employed increased by 1,150,000, or 60 per cent, while the total number of married women increased by only 23 per cent. As a consequence, the married workers formed 29 per cent of the total gainfully occupied women in 1930 as compared with 23 per cent in 1920.

Another phase of the employment of women in industry is

presented in the census data as to whether the homemaker—designated as that woman member of the family who is responsible for the care of the home and family—pursued a gainful occupation in addition to her household duties. Nearly 4,000,000 homemakers, or one out of seven, were thus employed in 1930, and four-fifths of this number were employed away from home. Over one-half of those employed at home were engaged in agricultural occupations. The largest group of those employed on work away from home were in the service industries (30.4 per cent); the second largest group was classified as "industrial workers" (23.4 per cent); and the third largest as office workers (15.9 per cent).

Gainful Workers by Social-Economic Classes

All gainful workers have been classified in occupation groups which permit distinctions to be made between head workers and hand workers, and which also provide further broad classifications according to mental ability and physical skill. The six main occupation groups shown in Table 3 are arranged, approximately at least, in descending order of the social-economic status of the workers in them.

The most significant changes between 1910 and 1930 in the distribution of the male workers were the decrease in the proportion of the total represented by farmers—from 19.5 per cent to 15.1 per cent—and the decrease in the proportion farm laborers formed of the total, from 15.6 per cent to 9.8 per cent. Since 1910, a greatly increased efficiency in farming operations has been effected by the wide introduction of more scientific farm practices and the widespread use of motor-driven machinery, with the result that fewer workers have been able to produce all the required supply of agricultural commodities.

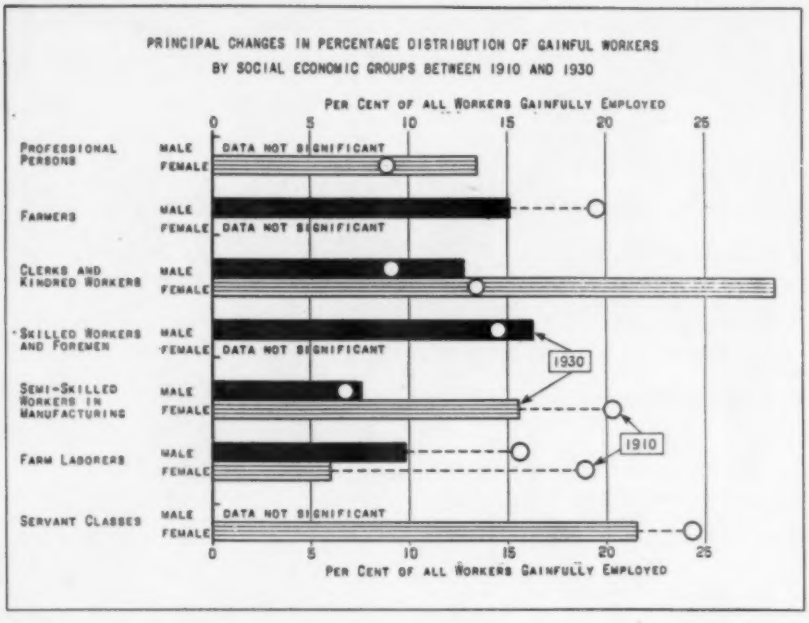
At each census the distribution of female gainful workers by social-economic groups has differed considerably from that of male workers. As compared with the corresponding pro-

TABLE 3. PERCENTAGE DISTRIBUTION OF GAINFUL WORKERS BY SOCIAL-ECONOMIC GROUPS

Group Classification	1930			1920			1910		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1. Professional Persons....	6.0	3.9	13.5	4.9	3.2	11.6	4.3	3.0	8.9
2. Proprietors, Managers and Officials.....	19.8	24.1	4.7	22.1	26.5	4.9	22.2	26.9	4.9
2*a*. Farmers (owners and tenants).....	12.3	15.1	2.5	15.3	18.5	3.1	16.1	19.5	3.4
2*b*. Wholesale and retail dealers.....	3.7	4.4	1.0	3.4	4.0	0.9	3.3	3.9	0.8
2*c*. All other proprietors, etc.....	3.8	4.6	1.2	3.3	4.0	0.9	2.9	3.5	0.7
3. Clerks and Kindred Workers.....	16.3	12.8	28.6	13.7	10.6	25.6	10.0	9.1	13.4
4. Skilled Workers and Foremen.....	12.9	16.3	0.8	13.4	16.5	1.2	11.7	14.5	1.2
5. Semi-skilled Workers...	16.3	14.3	23.5	16.0	13.2	26.5	14.4	11.1	27.1
5*a*. In Manufacturing..	9.3	7.6	15.6	10.5	8.1	19.5	9.6	6.8	20.3
5*b*. Other semi-skilled workers.....	7.0	6.7	7.9	5.5	5.1	7.0	4.8	4.3	6.7
6. Unskilled Workers.....	28.7	28.6	29.0	29.9	29.9	30.2	37.4	35.4	44.5
6*a*. Farm laborers.....	9.0	9.8	6.0	10.1	10.2	9.4	16.3	15.6	18.9
6*b*. Factory and building construction laborers.....	6.9	8.5	1.2	7.5	9.0	2.0	7.0	8.5	1.1
6*c*. Other laborers.....	6.0	7.5	0.3	6.9	8.6	0.4	7.4	9.3	0.2
6*d*. Servant classes.....	6.8	2.7	21.5	5.4	2.1	18.4	6.7	2.0	24.3

portion for males, the proportion of the females in the professional, clerical, semi-skilled, and servant groups is particularly large and the proportion in the other groups is particularly small. There was a very striking increase between 1910 and 1930 in the proportion of female workers engaged in clerical and kindred pursuits, a marked decrease in the proportion employed as semi-skilled factory workers and as farm laborers, and an appreciable decrease in the proportion employed as servants.

In comparing the social-economic status of the workers in the different population classes in 1930, it was found that a larger percentage of the native whites than of the foreign-born whites was in each of the first three main groups and a much smaller percentage was in each of the last three. The percentage both of native whites and of foreign-born whites was larger than that of negroes in each main group except "unskilled workers," where the percentage was over three times



as large for negroes as for native whites and considerably over twice as high for negroes as for foreign-born whites.

The connection between shifts in the occupational distribution of workers and the rate of population growth may appear to be somewhat obscure, but the relationship is important and the simultaneous changes in both items have been significant. For it is a well-established fact that the occupational composition of the population very decidedly affects the number of children born, as birth rates vary greatly between

different occupations. In general, it may be stated that the wives of manual laborers have more children than do those of the white collar workers and that economic success appears to be unfavorable to the raising of large or even medium-sized families. In view of these basic conditions, the census returns show certain changes in the increase and distribution of workers by industries which appear strikingly significant.

As may be observed from Table 3, the proportion of total male workers in the occupational groups which may be classed as mainly in the small family category—professional persons, proprietors (except farmers), managers, and officials, clerks and kindred workers, and skilled workers and foremen—increased from 34 per cent in 1910 to 42 per cent in 1930. During the same time the large family group—composed of farmers, semi-skilled and unskilled workers—declined correspondingly in relative importance from 66 per cent to 58 per cent. Such changes as these are contributing to a slower rate of natural increase.

Conclusion

An examination of the 1930 census figures on gainfully occupied workers discloses the great diversity of occupations in the industrial and business world. Outside of the agriculturalists there is no one great class. The factory workers form a large group, but they are split up into a wide variety of production activities and are subject to many different influences. Moreover, a comparison of the occupational statistics for 1930 with those for 1910 emphasizes the constant and sometimes rapid changes in industrial conditions which open up new employment opportunities to some groups of workers while leaving others stranded, at least temporarily. Thus the discovery or invention of new products may account for the development of new industries, which in turn may adversely affect some occupations that flourished in earlier decades. These occasional dislocations of labor tend to unbalance the

distribution of workers by industries, since the characteristic immobility of labor tends to delay the necessary readjustments.

In conclusion, the most striking tendencies indicated by a comparison of the 1930 census data on occupations with the corresponding 1910 figures are: the remarkable expansion of many basic industries, the rapid growth of several new industries, the declining importance of a few trades, the increased significance of women in industry, the drastic reduction in child labor, the enlarged proportion of native whites among total workers, and the increased importance of the white collar occupations. All these changes reflect marked economic and social progress, resulting largely from technological improvements in industry. Furthermore, these developments have a bearing upon the telephone market, both quantitatively and qualitatively, and a consideration of these changes is important to the telephone industry.

R. L. TOMBLEN

Notes on Recent Occurrences

CONFERENCE OF BELL SYSTEM PUBLIC RELATIONS OFFICIALS

A CONFERENCE of representatives of all Bell System companies, including the Western Electric Company and the Bell Telephone Laboratories, was held at Shawnee-on-the-Delaware, Pennsylvania, September 14–18, 1934, to discuss general matters relating to the System's publicity, advertising, and public relations policies. Vice-president A. W. Page, of the American Telephone and Telegraph Company, presided. Addresses by President W. S. Gifford and Vice-president Bancroft Gherardi of the American Telephone and Telegraph Company were important features of the program. Others of that company who attended the conference included S. L. Andrew, Chief Statistician; Harvey Hoshour, General Solicitor; K. S. McHugh, Commercial Engineer; W. J. O'Connor, Assistant to President; and members of the Information Department.

J. F. BELL ELECTED A DIRECTOR

AT a meeting of the Board of Directors of the American Telephone and Telegraph Company held on September 19, James F. Bell, of Minneapolis, Minnesota, was elected a director to fill the vacancy caused by the resignation of Eugene V. R. Thayer. Mr. Bell is Chairman of the Board of General Mills, Inc.